FLIGHT and The AIRCRAFT ENGINEER

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The Outlook

Iceland

THE Prime Minister expressed great satisfaction the other day when he announced that forces of the United States had occupied Iceland. That satisfaction will be shared by the country in general, and not least by the aeronautical fraternity. Iceland can be a most important point in the Battle of the Atlantic, as both an air and a naval base. As Mr. Churchill reminded the House of Commons, supplies for the American forces will have to pass through very dangerous waters on their way to Iceland, in fact through the same waters as the leased and lent supplies for Great Britain. The Government of the United States does not want to see either class of stores sunk by German action, and will certainly keep a careful look-out over those waters. Mr. Churchill, in a passage of classic understatement, "dared to say that it might be found in practice mutually advantageous for the two navies involved to assist each other. . . ." No doubt the aircraft of both the nations will also pass on any information which they may acquire on patrol. On the whole we may take it that the presence of American forces in Iceland will considerably relieve the strain which the Battle of the Atlantic has imposed on the Royal Navy and Royal Air Force.

The Americans had already taken the necessary measures in Greenland with the object of keeping the Germans from seizing a base so close to the American continent, from which they might some day have launched an invasion, and in the meantime could certainly have interfered seriously with the supply of munitions to Great Britain. This northern route is now safe except for the depredations of U-boats and raids by Kurier aircraft. Most aircraft built in North America can be delivered by air to the British Isles, using Greenland and Iceland, and perhaps the Shetlands, as refuelling points for the smaller classes, such as fighters. The distance from Reykjavik to Lerwick is only about 700 miles. Delivery by air is most desirable, both to save shipping space and as the safest way of getting the machines across. In the landing of the Americans in Iceland we see yet another step in the co-operation of the English-speaking democracies to withstand the Dictators.

It is not without significance, in this connection, to recall that for a great many years before this war the Germans took a very practical interest in the "northern route." Von Gronau surveyed it pretty thoroughly in a Dornier "Wal," and afterwards told the Royal Aeronautical Society of his experiences. Nor is von Gronau the only German who has had a good look at Greenland and Iceland, even before the war, so that President Roosevelt's decision to join forces with us in keeping the route safe for democracy, to use the phrase in a sense slightly different from the original, has about it a certain measure of poetic justice.

The R.A.F. Offensive

IT is fortunate that recent deliveries of new and powerful bombers have enabled the R.A.F. to start a concentrated offensive, by day as well as by night against targets in Germany and occupied territory, just at the time when German effort is concentrated against Russia. Whether the British raids are likely to bring immediate relief to the Russian forces may be doubted, for the enemy must have piled up reserves of fuel and machines near the Russian frontier before starting the

invasion. The amount of these reserves would be calculated as sufficient to last as long as Russian resistance was likely to last, with a margin. It is comforting to read that the German time-table has been upset by the resistance which has been encountered, but that has happened before without causing a German breakdown. So long as the German margin remains unexhausted, the enemy may be able to disregard the increased weight of the British attack. If the Russian resistance is maintained for far longer than had been foreseen, then the reserves will be used up, and replenishments from the factories will be needed.

If the R.A.F. Bomber Command succeeds in provoking the enemy into withdrawing fighter squadrons from his Eastern front in order to tackle the British raiders, the Russian armies would certainly be helped to a considerable degree.

Many of the best German fighters must have been transferred to the East, and those left in France are probably newly trained pilots with a leaven of experienced men. Consequently, our fighter losses have been low in comparison with theirs, and the Messerschmitts have been unable to protect their targets. A fighter escort must be prepared to suffer losses in order that the bombers may be undisturbed while aiming their bombs, and for that object higher losses than those suffered would have been justified. While the Eastern campaign rages the Germans may be content to leave things as they are in the West. We naturally hope that they will deplete their Eastern force of fighters, and they may be determined not to oblige us.

But, we repeat, if the Russians continue their heroic resistance until the German margin of reserve supplies gives out, the enemy may be obliged to reconsider his tactics. He cannot continue indefinitely to leave the Ruhr and other important industrial areas without adequate fighter defence.

Dive-bombers and the Army

THE question of supplying the Army with dive-bombers is wrapped in mystery. The mystery deepened in the debate in the House last Thursday, when the Minister for Aircraft Production, Lt. Col. Moore-Brabazon, made a statement on the subject. "It is not for me," he said, "to impose upon the Army any particular type of machine. They may not have thought the dive-bomber a machine which they wished to operate, but the whole question of Army co-operation is so active and so near us now that things may change. It may be that dive-bombers will be wanted, but up to the present I have not been asked to supply them."

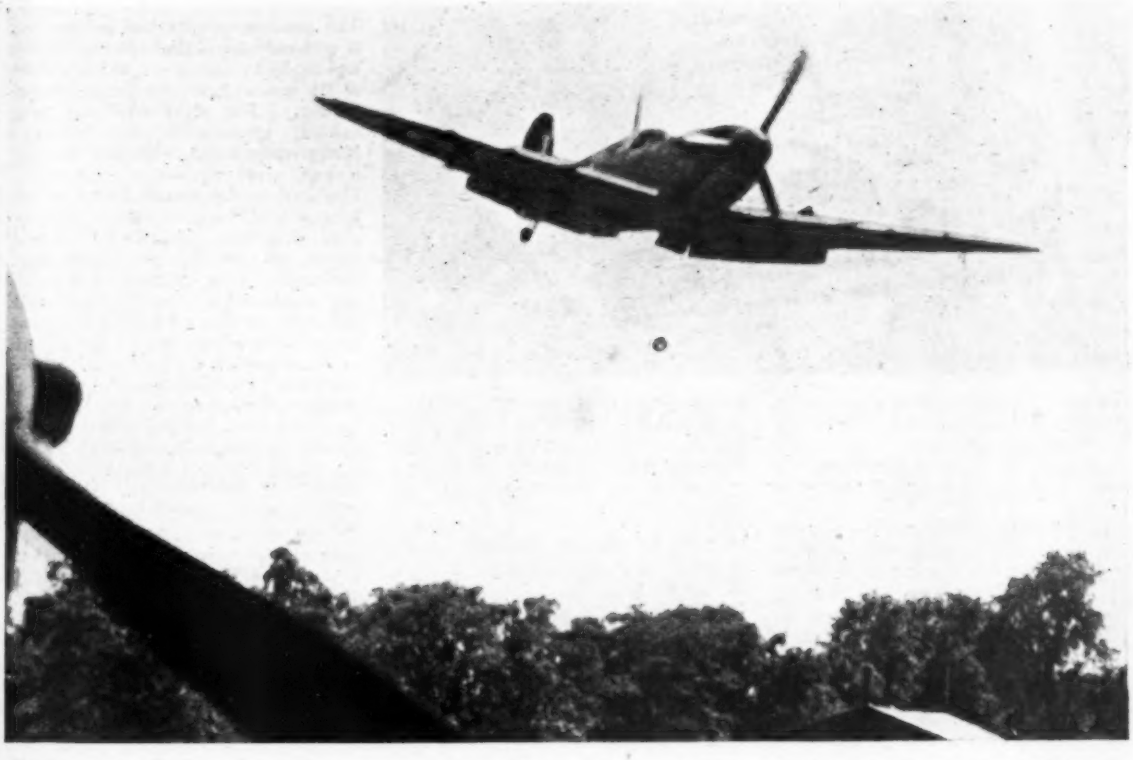
Some time ago, when the R.A.F. Army Co-operation Command was instituted, it was explained that the Air Ministry did not propose to go in for a specialised dive-bomber on the lines of the Ju 87, but to introduce a bomber of a more general type, which could be used for effective attack on ground targets. Since then many American types have been reaching this country. The American Army Air Corps has long had a section devoted to the study of what is there called "Attack," meaning attack on ground targets. In Britain not nearly enough thought has been given to air help for the Army, and we have accordingly suffered. It is wise to make use of such American experience as is available. If the U.S.A. supplies the machines, the Minister for Aircraft Production may not be asked for dive-bombers.

There may be more in Col. Moore-Brabazon's words than meets the eye. What did he mean by saying that the whole question of Army co-operation is now active and near to us? Coming so soon after the rather mystic expressions used by the Prime Minister in the debate on Crete, these words seem to portend some change. Certainly a change is needed in the relations of the Army and the Air Force.

TWENTY-FOUR-HOUR R.A.F. OFFENSIVE : A shell-gun armed Spitfire V back from a daylight sweep taxies to its dispersal point as the sun sets in the evening. Elsewhere, bombers take off for raids over Germany and "intruders" (long-range night-fighter-bombers) set out to disturb the flying programme on *Luftwaffe* aerodromes.

War in the Air

Enemy Heavily Bombed : Night-fighting Successes : Eleven Days in a Dinghy



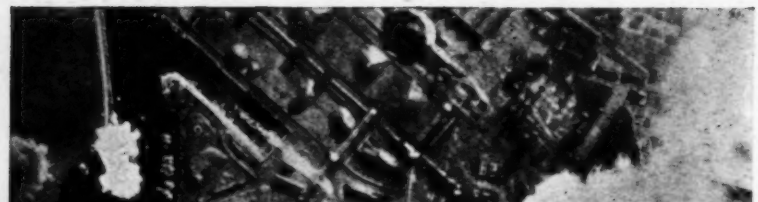
EVERYDAY HEROISM : A Fighter Command pilot making a "wheels up" landing on his Spitfire V after being badly shot about during a daylight sweep over France. The pilot, who has the D.F.C., was wounded in two places.

WHETHER it will give direct help to the Russians or not, the R.A.F. has been increasing the weight of its attacks on Germany and occupied territory ever since the German armies invaded the Soviet territories. Some German towns have barely thought about pulling themselves together after a night attack when the Bomber Command has sent over day-raiders, mostly Blenheims, with strong fighter escorts. Great pains are taken to see that the British fighters are in superior numbers as compared with any defensive fighters which they are likely to meet, and they have given splendid protection to the Blenheims while the latter have gone in to take sure aim at clearly seen targets. Losses have been suffered by the R.A.F., but though they are the attacking side they have shot down more of the enemy than the Messerschmitts have been able to shoot down of them. When the fighting has taken place over the Channel some British pilots have been picked up after jumping with their parachutes. It may well be that more of the pilots whom we miss have got safely to earth and been made prisoners of war. That is one penalty of fighting over enemy territory. Another disadvantage is that a good many enemy machines may only be counted as "probables," whereas if they had fallen on British soil they would have been certainties. So, on two grounds, the real advantage of the R.A.F. is probably greater than the official reports are able to show.

R.A.F. Night Fighters

ONLY occasionally has the *Luftwaffe* attempted to strike back. Southampton had a bad raid one night, and on other nights there have been light scattered raids. British night fighters have been helped by the fine nights and bright moon, and even when there have been few German machines overhead, our men have made gratifying bags.

A raider destroyed one night was shot down by a Hurricane night-fighter pilot who chased it nearly back to France. The pilot told his story on landing just one hour after first picking up the German. "The Hun must have seen me first," he said, "and was in such a hurry to get away that he only just missed some barrage balloons. He dodged in one direction after another and then started off south, going the fastest I have ever seen a Ju travel. It was hell for leather for a time before I finally caught him. It was a glorious night and I was able to recognise him even better because of the gun flashes coming from the shore. I hit him with my first burst and was almost blinded by flames from the blast. He ducked immediately and went down to just over 1,000 feet but I got under him and slapped him well and truly in the belly with an eight-seconds burst. He was in a bad way but, to my amazement, my next attack with a three-seconds burst which hit him right in the fuselage did not seem to take any effect. For about a minute nothing happened,



TARGET BEFORE DAYLIGHT SWEEP: The power station at Comines at the start of a raid. (1) Boiler house. (2) Pump house. (3) Water circulating pipes. (4) Turbine house. The first bomb burst is seen on the bank of the canal.

and then a huge sheet of flame burst along the entire length of the aircraft and down it went into the sea. As it sank great clouds of steam began to rise. I thought it was time for me to go home."

In the Mediterranean there have been more raids on Benghazi and other ports and aerodromes in Libya, while on one day a daring raid was made on the beautiful harbour of Palermo on the northern coast of Sicily. Two bombs hit a ship of 8,000 tons, and hits were also made on ships of 5,000 tons and 2,000 tons respectively. A ship of 1,000 tons, which was set on fire by three bombs, emitted clouds of black smoke, accompanied by an explosion. Another 5,000-ton ship was hit by incendiaries. Pilots and rear gunners of our aircraft heavily machine-gunned cruisers in the harbour. The attack caused great confusion and alarm and occupants of small craft were seen leaping into the water. When the raiders were four miles away from their target, explosions were still taking place near the dry dock.

Spanish reports say that a U-boat which was lying in wait for a big British convoy of 27 ships to pass through the Straits of Gibraltar was spotted and sunk by the Fleet Air Arm. Two members of the crew were said to have been rescued and taken as prisoners to the Rock.

Cyprus is now in the firing line and has had many "alerts" and a few raids, but the early visitations of the enemy bombers did very little damage. It is stated that the civil population has not been at all excited or perturbed by these incidents, and that the A.R.P. people are functioning efficiently.

WAR IN THE AIR

An Awful Ordeal

FROM the Mediterranean comes a story of endurance, bravery, and tragedy, when four members of the crew of a heavy bomber were picked up after being eleven days afloat in a dinghy. The other two men lost their lives in a gallant attempt to reach help. The port engine of the heavy bomber aircraft in which the men were flying failed over the Mediterranean. The aircraft quickly lost height, and it was only by skilful piloting that it was made to glide down to the surface of the sea without submerging immediately. For eight days the crew drifted, exposed to the relentless Mediterranean sun, with only one and a half pints of water. This they hesitated to drink, not knowing how long it would have to last. In addition, they had nine biscuits, fifteen pieces of chewing gum, and some chocolate. They rationed the water to two teaspoonfuls twice daily. At dusk one night they saw six aircraft. They fired a Very light, but as the aircraft approached they were recognised to be German. The men then destroyed all their papers and maps. They need not have troubled, for the enemy aircraft passed by overhead.

A Gallant Effort

ON the eleventh morning they saw on the horizon four British destroyers. They were at target practice, and two of the airmen on board the dinghy decided to make a bold bid to attract attention. They plunged overboard and set out on a four-mile swim. They were never seen again, and eventually, to the mortification of the bomber crew still on the dinghy, the ships on the horizon gradually vanished out of sight.

Three hours later, two Dornier sea-

TARGET AFTER DAYLIGHT SWEEP: This photograph, taken within a few seconds of the one above, shows the results of the first run over the target. Boiler house, pump house and water circulating system have all received direct hits.

WAR IN THE AIR

planes, which formerly belonged to the Jugoslav Flying Corps, sighted the dinghy, and one circled overhead and dropped a bottle of water, cigarettes and chocolate, wrapped in a "Mae West" to prevent the package sinking. The other Dornier sped off, returning later with a destroyer, which picked up the exhausted men. A thorough but unavailing search was made for the other two members of the crew of the dinghy who had tried to reach the destroyers.

The air position on the Russian front is naturally somewhat obscure. Nobody trusts the figures published in the German communiqués; we learnt their method of reversing victories and losses last year. It is apparent, however, that the Red Air Fleet has not been knocked out by the *Luftwaffe*, but continues to exist as a fighting force, and to fight. Very rightly and wisely, it is not attempting too ambitious a programme, but is mainly confining its efforts to tactical bombing on the various battlefields, in addition, of course, to normal air reconnaissance and normal use of fighters against all classes of German aircraft. Some commentators are apt to forget that when a battle is in progress an Air Force must for the time abandon all other objects and make its utmost contribution to the winning of that battle. On that principle the Germans have no doubt withdrawn air formations from France to the Eastern front.

Russia's Resistance

AS yet we have no information about the merits of new Russian types, such as the new fighter, the I 18, but generally speaking the expectation is that the *Luftwaffe* must be superior to the Red Air Fleet in everything except numbers and individual courage. That makes it all the more gratifying that the Russian airmen are still able to exert an influence on the course of the fighting, paying special attention to the Panzer divisions. If the *Luftwaffe* were able to overwhelm the Russian air power, the former might interrupt communications behind the Russian front lines, with disastrous results. The contribution which the Russian Army ought to make to the combined task of defeating the Germans is to avoid being completely destroyed itself. Even if there must be more Tannenburgs, there must certainly be no more Brest-Litovsks. If the Russians can continue fighting and containing large numbers of Germans, even though it means retreating and evacuating territory, they will terribly embarrass the German staff. Hitler wants to make a quick end of Russia; the Russians must avoid a quick decision. Whether the roads and railways will permit of the retirements which will probably become necessary for the carrying out of that policy must depend largely on whether the Red Air Fleet continues to dispute the air with the *Luftwaffe*, or leaves the latter a free hand to play havoc with the means of retreat.

ENEMY AIR LOSSES TO JULY 12th.

		Over G.B.	Over Continent	Middle East
July	6	3	12	6
"	7	6	7	3
"	8	6	19	8
"	9	4	13	3
"	10	2	16	6
"	11	1	9	7
"	12	0	6	6
		22	82	39

Totals: Northern Area, 5,050; over 1,956. Middle East,

FRIENDLY BULLETS: British gunners in the Near East using a captured Italian 20mm. Breda gun to shoot down German aircraft. The shells in the clip are of mixed varieties.

Two Agreements

TWO very satisfactory agreements have been made. Terms for an armistice in Syria have been settled, and the "Cease Fire" was sounded at midnight on Friday last. So this deplorable little campaign came to a satisfactory end. The Vichy troops, consisting mainly of the Foreign Legion and Senegalese battalions, fought well, but they were beaten by a grand example of co-operation between the three Services, Army, Navy and Air Force, such as has been typical of Middle East operations. The Allied troops, British and Free French, advanced with skill as well as with courage, and kept their objects always before their eyes. Those objects were to carry their objectives with a minimum of bloodshed on either side. The Air Force speedily established a superiority over the Vichy aircraft, which greatly assisted the troops, while the Navy shelled the Vichy positions along the coast road where the gallant Australians were advancing and, which was quite as important, prevented any reinforcements from reaching the Vichy commander in Syria. Iraq is now satisfactorily cut off from any more German attempts to cause trouble there, and Turkey is relieved from any anxiety that the Axis may establish itself on her southern border. In addition, numbers of Allied troops are now set free for use elsewhere.

The other agreement is with Soviet Russia. Britain and the Soviet Union have agreed to give each other all possible assistance in the struggle against Germany, and have undertaken that neither will negotiate or conclude a peace or armistice without mutual agreement. The Dominion Governments have approved the agreement, which is, in effect, a treaty of alliance, though that expression has not been used in announcing the facts.

The first impetus of the German invasion was brought to a stop for a while, presumably because the Germans needed a breathing space in which to overhaul their tanks and to reform their tired and battered formations. When this had been done, the invaders came on again, and made loud claims of having broken through the so-called Stalin Line. It is always wise to wait before accepting such claims. The Russian armies and the Red Air Fleet were still full of fight when the German advance was resumed, and the end is not yet in sight.

BRITISH AIR LOSSES TO JULY 12th.

		Over G.B. Aircraft	Over G.B. Pilots	Over Continent Aircraft	Middle East Aircraft
July	6	—	—	15	—
"	7	—	—	16 (2 pilots safe)	—
"	8	—	—	21 (3 pilots safe)	5
"	9	—	—	8 (1 pilot safe)	—
"	10	—	—	17 (2 pilots safe)	1
"	11	—	—	4	2
"	12	—	—	5	3
		0	0	86	11

Totals: Northern Area, 2,256; about 337 Middle East,

HERE AND THERE

Indian Manufacture

THE first aeroplane to be made in India has been completed by the Hindustan aircraft factory, it is reported by the *Daily Telegraph*.

U.S. June Production

MILITARY and heavy commercial aircraft produced in the United States during the month of June totalled 1,476. This exceeds the total for April, which was the next highest, by 49. Lowest for the first six months of the year was February with 972, while monthly production over the half-year averages 1,223. Britain usually receives a little under half of each month's total. The rapid rise in numbers during the first four months has not been maintained because increasing emphasis is being put on bombers instead of trainers, these requiring many more man-hours of work to each machine.

Canadian Machine Guns

GREAT BRITAIN is to take the whole output of a new $8,000,000 plant at Windsor, Ontario, which will specialise in the manufacture of an automatic machine gun for aircraft, heavier than the Colt-Browning.

The factory will operate through General Motors of Canada and a Government company to be known as Border City Industries.

Women Ferry Pilot for U.S.A.

MISS PAULINE GOWER will shortly go to U.S.A. to help organise a women's ferry service to fly American aircraft from the factories to Canada on their way to England, it is reported by *The Times*. Miss Gower is head of the women's section of Air Transport Auxiliary, this section being concerned with the delivery of Tiger Moths, Miles Magisters, Harvards and Oxfords.

The Low-down

THERE is no doubt about it, the low-wing monoplane has caught on. Even printers are getting low-wing-minded. Last week, on our "Friend or Foe" page, the printers turned the front elevation of the Consolidated 31 upside-down, and a most unusual-looking aircraft, with negative dihedral, vee-shaped roof, and a most ferocious "face" was the result. What made matters even more amusing was that, according to the line of text just above the picture, "The Consolidated 31 is so different . . ." After that who will say that printers have no sense of humour?

"Tail Unit Design"

IT is necessary to make a correction applying to page *b* of the article "Tail Unit Design." From the fifth line the last paragraph should read:

"A disturbance, such as the nose having been depressed by a gust or by a forward movement of the stick, has increased the speed to 140 m.p.h. (represented by point A). Left to its own devices, the aeroplane puts its nose up and the speed decreases until it reaches 120 m.p.h. again. The decrease continues but does not reach 100, and then increases again. So the oscillations continue, but always dying down, until the aeroplane is again flying straight and level at its original speed of 120 m.p.h.

NEW A.W. DIRECTOR: Mr. H. M. Woodhams, general manager of Sir W. G. Armstrong Whitworth Aircraft, Ltd., has recently been appointed to the board of directors. Mr. Woodhams is one of the old-timers of British aviation, having entered the industry in 1909 and graduated through all its branches. Before joining the A.W. company in 1923 he served with such firm as De Havillands, Sir Alan Cobham, and the now defunct Air Transport and Travel, one of the Holt Thomas companies.

U.S. Fighters May Fly Here

THE suggestion that auxiliary fuel tanks could be fitted to American fighters to give them the required range for delivery across the Atlantic under their own power has been aired more than once in the columns of *Flight*.

Now we learn, from the Washington correspondent of the *Daily Telegraph*, that this may be done in the near future in consequence of conferences on the subject between British and American experts. The necessary plans are said to be complete for the fitting of 75 gallon tanks to certain American fighter types. These extra tanks would be used for the first part of the flight and then dropped in the sea to lighten the aircraft as much as possible for the rest of the crossing.

O.P.M. Chief Here

FURTHER proof of the determination of the United States of America to leave nothing undone which may help to expedite the production and smooth functioning of aircraft is afforded by the recent arrival in this country of Mr. Merrill C. Meigs, chief of the aircraft section of the Office of Production Management. Before he took up this post Mr. Meigs had considerable experience of aviation, being a private owner and holding in addition a transport licence, in normal times he is a publisher. While in this country he will discuss with Mr. W. C. Devereux, who recently was appointed Controller of North American Aircraft Supply, ways and means by which the problems peculiar to our requirements can be solved.

A Ford Engine?

THE Ford Motor Company is reported by *Canadian Aviation* to be developing a 12-cylinder in-line liquid-cooled engine. It is said to be supercharged to a high altitude by means of an exhaust-driven turbine and to have petrol injection directly into the cylinders. Steel castings rather than forgings will be used to reduce machining work as the company has specialised on centrifugal casting. Take-off r.p.m. is given as 3,600, and the rated altitude is 30,000ft.

W.A.A.F. Want Car Drivers

ANY young woman between the ages of 17½ and 43 who holds a "clean" driving licence is now eligible to join the W.A.A.F. as a motor driver. Previously it was stipulated that applicants must have held a licence for some years, but this qualification has now been waived in view of the needs of the Force for drivers of staff cars and light vans.

Even if her licence has expired it does not matter because it will be officially renewed if her services are accepted. Application should be made at Victory House, Kingsway, or any W.A.A.F. recruiting centre.

Carbon Monoxide Danger

STARRAT AIRWAYS in Canada is installing carbon monoxide indicators in the cockpits of its aircraft, it is reported by *Canadian Aviation*. This follows an official accident report which stated that the pilot of a civil transport died of carbon monoxide poisoning, the gas having come from the exhaust. Investigations showed that even 12 drops of oil, if burnt in the tube carrying heating air to the cockpit, could produce enough carbon monoxide to kill the pilot.

C.P.R. Takes Over

CO-ORDINATION of the services of Canadian Airways, Ltd., and Mackenzie Air Service, Ltd., by Canadian Pacific Railway, was announced at Edmonton, Alberta, by W. M. Neal, C.P.R. vice-president in charge of western lines. The two companies will operate under the title of United Air Services, Ltd., C.P.R. having obtained a controlling interest in them.

W. Leigh Brinthel, president of the Mackenzie Air Service, will be manager of United Air Services and will have direct charge of operations in the Mackenzie River area as well as the run to Prince Albert, Saskatchewan. These were previously operated separately by Canadian Airways and Mackenzie Air Service. General direction regarding business policy is in the hands of the advisory committee of United Air Services. Mr. Brinthel has selected W. J. Windrum, formerly of Prince Albert and recently in charge of Canadian Airways operations, as assistant manager.

This announcement will recall the paragraph on page 420 of our issue of June 19th, in which it was stated that C.P.R. had acquired majority interests in these two companies and three others.

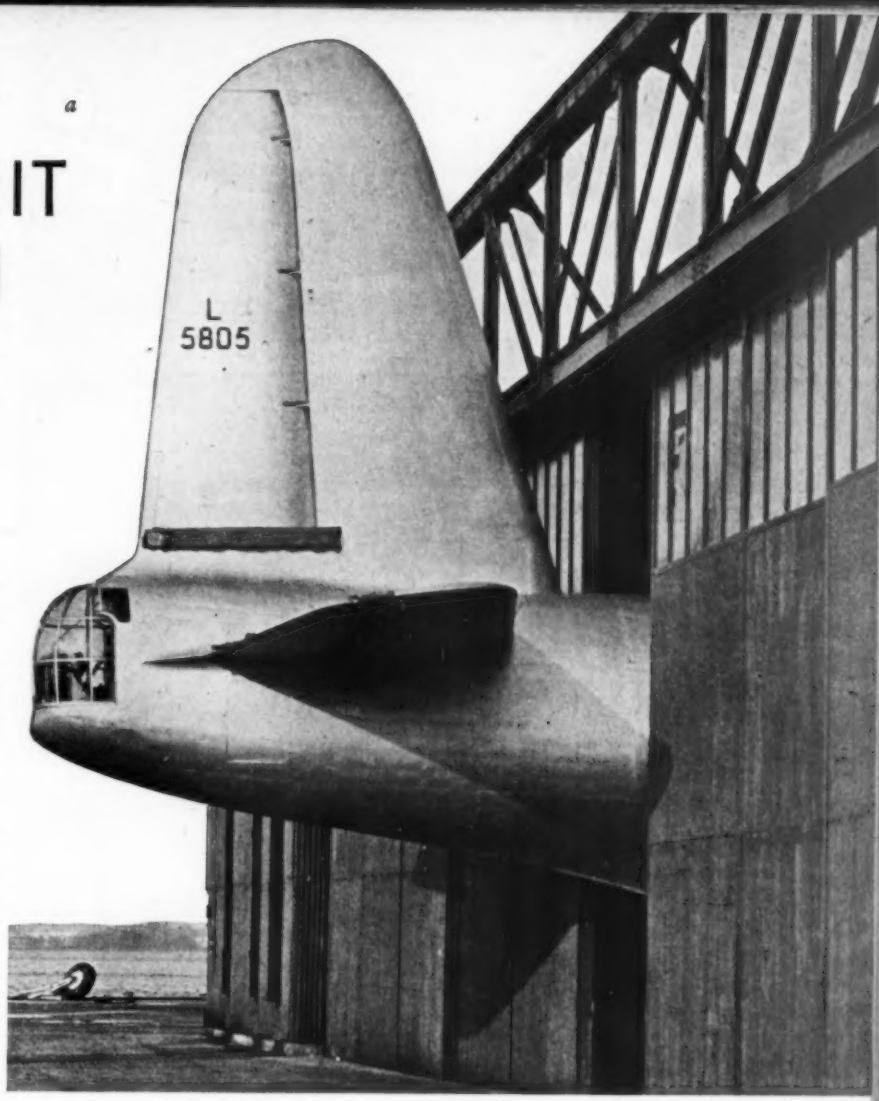
TAIL UNIT DESIGN

Triple, Twin or Single? Importance of Aspect Ratio: Design Knowledge Lags

By BRUCE FOSTER, B.C.E., D.I.C., A.F.R.Ae.S.

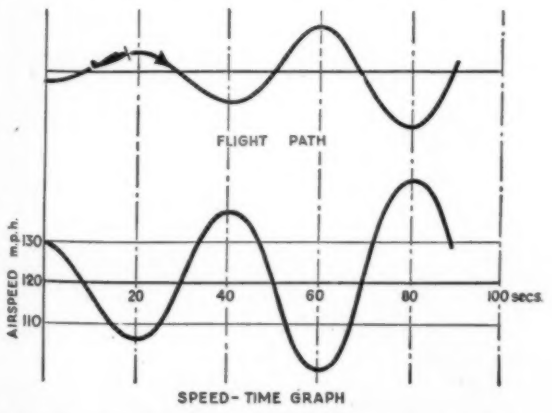
SEVEN years ago I said to a man very well known in aeronautical circles—whatever they may be—in this country, "How are the areas of the tail surfaces of an aeroplane determined—the rudder, for example?" "Well," he said, "the designer looks up the area of the rudder on his last successful design and uses that. And if that does not turn out too well in the test flight, he uses the area of the last but one."

This reply rather shattered my immature notions of the infallibility of aircraft designers, and in my mind they at once joined the doctors, lawyers and dentists. But this was seven years ago, just at the start of the twin-engined, low-wing era. Now times have changed and knowledge has increased. But the difficulty of the problem of tail design has also increased and it has at least kept pace with the increase of knowledge which has resulted from the greatly increased research facilities that have become available. The greater engine powers, giving more violent slipstreams; the higher standards of controllability demanded after failure of one engine; the greater wing loadings, reducing wing size; and the refinement in fuselage shape; all have altered the basis on which the old empirical formulæ for tail surface area were founded. Designers all over the world have been hard put to it to build anything firmly on this quicksand of change and, as G. S. Shairer, of Boeing, said in a recent paper, "The problem of designing vertical tail surfaces has become increasingly more difficult in recent years. That this is so has been proved many times by the changes in tail surfaces which have occurred on nearly all large aeroplanes in recent years."

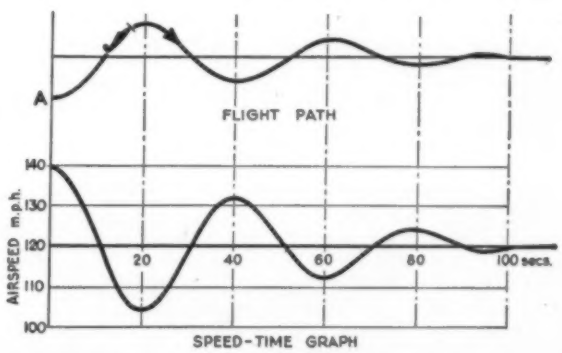


"The fin and rudder of the Sunderland are beautifully designed, with about as high an aspect ratio as is ever used."

Mr. Shairer refers in his paper to vertical tail surfaces only, and shows the alterations required on the fin of the Boeing 307 Stratoliner, and why. It is certainly these vertical surfaces which have been most worry to designers in recent years, but in the early 1930's more attention was focused on the horizontal surfaces, the tailplane and the elevator. This was due to the greatly increased popularity of the low-wing monoplane with engines mounted in wing nacelles. Unaccountably (at first) it was found that several



LONGITUDINAL INSTABILITY. This aeroplane, though statically stable, is dynamically instable and its oscillations become greater and greater.



LONGITUDINAL STABILITY. Dynamic stability reduces the oscillations and straight and level flight is resumed without interference by the pilot.

THE BOEING 314 CLIPPER appeared first with a single fin and rudder. This was later altered to a twin tail, but the addition of still more fin area was required, and the final version now flies the Atlantic with three fins

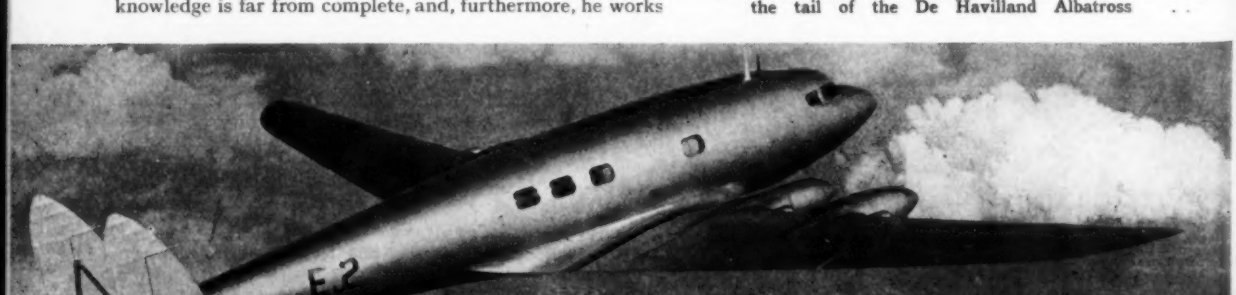
aircraft, with tail surfaces designed according to widely accepted formulæ based on previously successful designs, were unstable longitudinally. In some cases the machine was quite stable with engines off, but with engines on developed instability which could not be tolerated. The explanation appeared to be that unpredictable slipstream effects were set up by the flow of air round the nacelles when the power was on. This trouble was widespread and resulted in a considerable change of the established ideas on tailplane and elevator area.

Later, the fin and rudder have caused more grey hairs for the designers. The Boeing 314, the now famous Pan Amercan Clipper, had only a single fin and rudder when first flown. This was inadequate to provide directional stability, and the tail was redesigned with twin fins and rudders of end-plate type substituted. But this arrangement also had to be changed by the addition of a central fin before the boat became the great success which it is to-day.

This article is a non-technical survey of the state of knowledge in one branch of aeronautical design, not a harping on designers' mistakes. The lot of the aircraft designer is a hard one. He works in a science in which knowledge is far from complete, and, furthermore, he works in the broad light of day compared with many other professional men. If he produces a new design which is not quite like any other aeroplane that has yet been built, and the tail turns out to be inadequate, the fact is widely known. The designer has not the possibilities of concealment available to the surgeon or physician, or the smoke screen of bewilderment with which the unscrupulous lawyer can blind his client, for a ten- or twenty-ton aeroplane or thirty-ton flying boat is not easy to conceal.

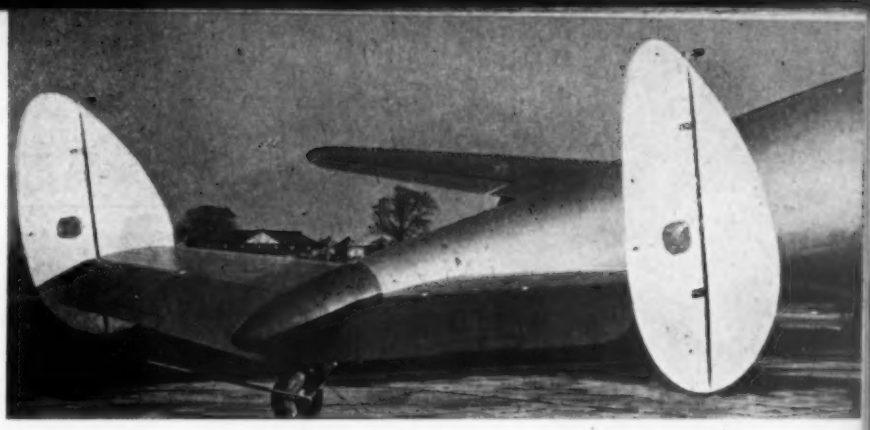
The purpose of a tail is to make the aircraft controllable and stable. It is controllable if the pilot can manœuvre it as he desires by means of elevator and rudder (and, of course, ailerons, though they do not enter this discussion). Stability is a different characteristic. An aeroplane is said to be stable if, after receiving some small disturbance from equilibrium in steady flight, it returns to this same steady condition of flight without any aid from the pilot. The "small disturbance" may be an up-gust under the tail which puts the nose down and so causes an increase of speed. If the aeroplane then tends to return to its original level attitude and to its former speed *without help from the pilot*, it is said to be statically stable. But it may "over correct" itself and, coming out of the dive, may climb and climb until its speed has dropped much below the original value. Then it may start to dive again and repeat these actions with greater and greater magnitude until it either dives into the ground on one of its wild swoops or loses so much speed in the climb that it stalls. Such an aeroplane, though statically stable, is dynamically unstable; the diagram is a representation of its mad frolics after it has been disturbed in straight and level flight and left by the pilot to right itself.

But what is required is an aeroplane which is both statically and dynamically stable; in other words, one which behaves as in the second diagram. This shows the aeroplane to have been trimmed to fly straight and level at 120 m.p.h. A disturbance, such as the nose having been raised by a gust or by a backward movement of the stick, has reduced the speed to 100 m.p.h. (represented by point A). Left to its own devices, the aeroplane puts its nose down and the speed increases until it reaches 120 m.p.h. again. The increase continues but does not reach 140, and then decreases again. So the oscillations continue, but always dying down, until the aeroplane is again flying straight and level at its original speed of 120 m.p.h.



Twin fins and rudders were adopted for the first version of the tail of the De Havilland Albatross

TAIL UNIT DESIGN



. . . but though the twin type was retained, the fins and rudders were shifted outwards to act as end plates, a much more efficient arrangement.

This is an example of longitudinal stability, the characteristic which it is the function of the tailplane to provide. But there is also directional stability, a question of fin design, and this has been the biggest millstone round designers' necks in the last few years. The centre of pressure of a body such as a fuselage is ahead of the centre of gravity, in fact, it is near the nose. So if a slight disturbance yaws the aeroplane, the air pressure, applied at the centre of pressure, tends to turn the craft still further. This, of course, means that it is unstable. But air pressure on the fin provides a moment opposing this effect and keeping the aeroplane nose into wind. But how big shall the fin be made?—that is the question to which the present state of aeronautics does not give completely satisfying answers.

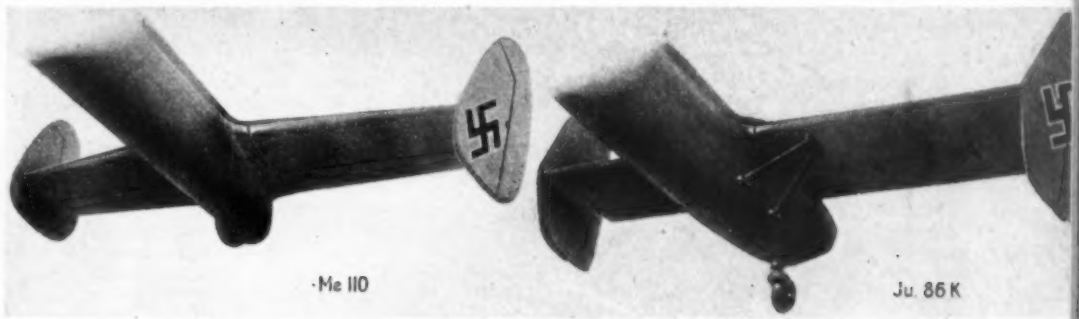
Naturally, the longer the fuselage the smaller may the fin be, since with a longer fuselage, it exerts its force with a longer moment arm. In this connection it is noteworthy that the short fuselage of the little Stinson 105 calls for a large fin and rudder.

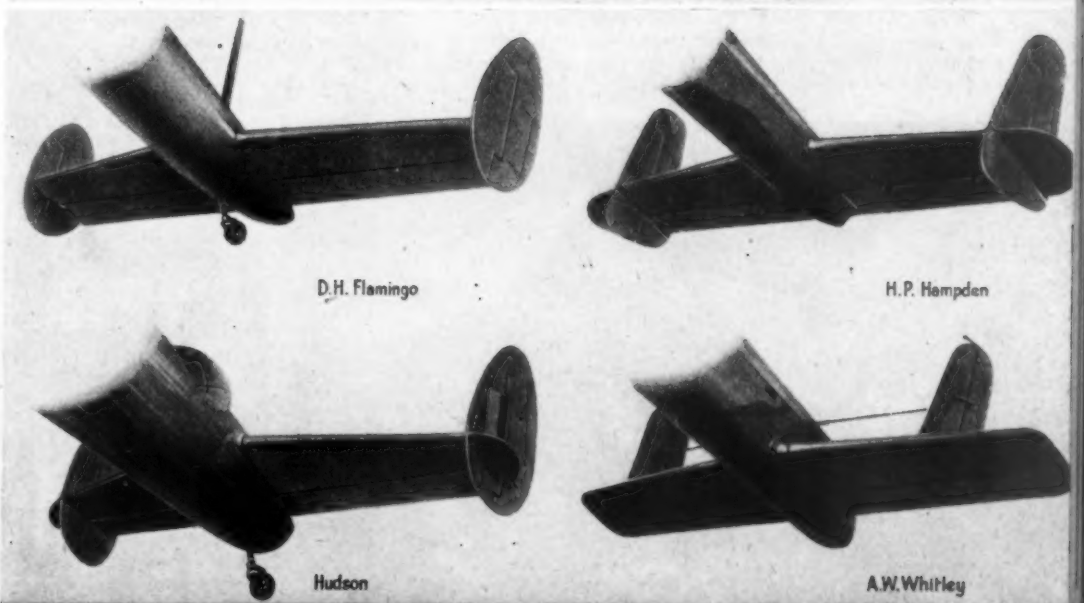
In past years fin and rudder areas were fixed to a large extent by consideration of wing area, but wing loading has now increased so much that the wing area has decreased greatly. But the instability of the fuselage remains and a new criterion for fin area has been proposed by F. L. Thompson at the 1940 S.A.E. Aeronautic Meeting. This takes account only of the fuselage diameter (D), length (L), and length of tail (l). He considers that adequate fin area is given by the relation: Fin area $= \frac{0.4\ D^2L}{l}$

It may sound strange to talk of "vertical surface stalling," but this can happen, though it is an unusual phenomenon, and may be accompanied by reversal of rudder force. This, of course, is most disconcerting to the pilot and may be very dangerous, since it may involve loss of control. Stalling of the fin may occur at about 15 deg. angle of yaw. This is a large angle of yaw, but can occur with a multi-engined craft climbing very slowly at a steep angle at full take-off power if partial engine failure happens. The Boeing Stratoliner photograph shows the great amount of rudder which must be applied to hold a large aeroplane straight when both engines on one side are "out."

The change which was made on the De Havilland Albatross illustrates very well some of the principles of tail design. Both original and final designs are of the twin-tail type, but the second is very much the better. Instead of the fins sitting on the tailplane at about the half points, they are arranged as "end plates" to the tailplane, thereby making it much more efficient since they reduce the "end loss" which always occurs at any wing tip. It will be noted, too, that the area of the fins has been increased.

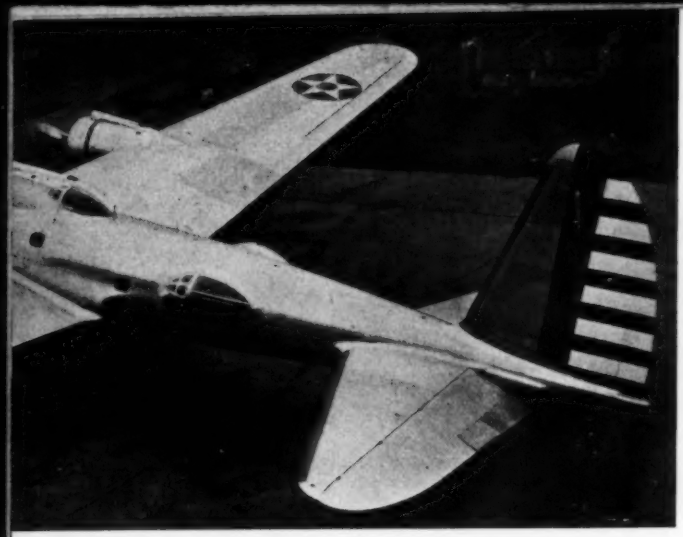
"End loss" raises the question of aspect ratio, a quantity which seems to be forgotten frequently, judging by the strangely stubby shapes of tail surfaces which are sometimes seen. A circular shape for fin and rudder is sometimes adopted, but who would use such a shape for wing plan form, with its aspect ratio of one? Yet the same considerations apply to the side view of fin and rudder as to wing plan form. Aerodynamic efficiency is just as important for stability and control surfaces as for wing surfaces. With greater efficiency the surface can be smaller and, therefore, lighter. The fin and rudder of the Sunderland are beautifully designed, with about as high an aspect ratio

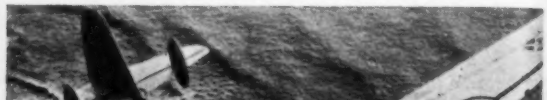


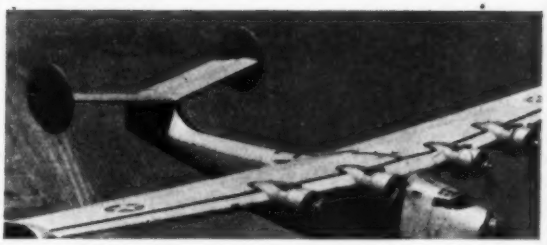


SIX TWIN TAILS representative of British, German and American design. The Me 110 and the DH Flamingo are of the most modern practice. The small pieces of tailplane outside the fin on the Hampden and Hudson are of very doubtful efficiency. The Whitley fin is placed sufficiently close in to allow it to be strutted for rigidity.

TAIL UNIT DESIGN







(Above) THE BOEING FLYING FORTRESS is a successful example of a large aeroplane with single fin and rudder. The tailplane is set well forward.

(Right) THE CONSOLIDATED PB2Y in its original and final forms indicates a change from the single tail, with auxiliary fin surfaces, to the more modern twin type.

as is ever used, and that of the Wellington is very similar.

The increase of fin area by adding it in the manner adopted on the Boeing Stratoliner interferes as little as possible with the structural design, but the aerodynamic efficiency of the new area must be very low. Its "aspect ratio," if such a quantity for the added area can be spoken of, is so low as to be fractional, and, furthermore, the moment arm about the centre of gravity is very much smaller than that of the original fin. On both counts its effectiveness is low. To some eyes, however, the "fairing-in effect" to the fuselage will look "right," but actually there appears to be no need for any such thing since the only change of direction to which air flowing along the top of the fuselage is subject is in the horizontal plane. Therefore, no vertical "fairing" is needed. The Wellington and the Sunderland testify to this.

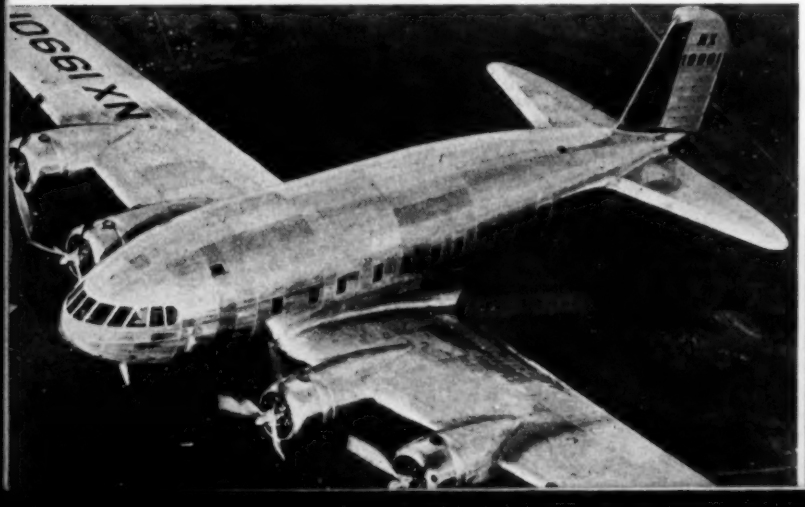
How Many Fins?

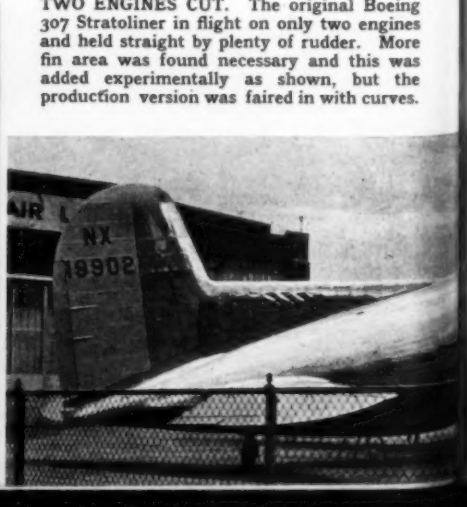
In seeking a high aspect ratio one has to be careful not to make the fin too high and thin, or it would be too flexible and might cause serious control or flutter troubles. A designer is very rarely free to choose his fin and rudder shape without restrictions. To give it high aspect ratio increases its height, and the height of the hangar door, particularly for nosewheel craft such as the Douglas DC-4, may impose a limit. For end plate fins the lower ends must be sufficiently high for ground clearance or, in the case of flying boats, so that they will be above the worst of the spray. But neither of these restrictions is likely to dictate the adoption of a very low aspect ratio fin and rudder and the reasons for some shapes seen are not at all apparent. Research has shown, however, that if a fin and rudder are of the end-plate type the relative proportions above and below the tailplane do not affect the aerodynamic efficiency of the tailplane or rudder control.

The question of single or twin fins and rudders has not been settled and gives no indication that it is likely to be settled in the near future. The answers to it are as diverse as the leviathan four-engined Douglas B-19, with a single fin and rudder, and the single-engined General Aircraft Cygnet with a twin tail. (Incidentally, the Cygnet has the fin interchangeable with the rudder, probably a unique arrangement.) On the question of single *v.* twin there are certain considerations which must be borne in mind by the designer in making his selection, but there is certainly no unanimity of opinion throughout the world on this subject.

If the aircraft is a military one, a single fin and rudder gives less reduction of the field of fire of the rear gunner, and this consideration generally overrides everything else in fighter and bomber design. But civil craft do not have this hampering restriction, and the twin tail is much more general though by no means universal. The latest Curtiss-Wright transport is a notable newcomer with a single tail, but Lockheed, a firm distinguished for the versatility and soundness of its work as well as the liberality with which it makes its information available to all, always goes in for twin tails. (No firm which continues its design work through the years ever goes on entirely trouble-free; the early Lockheed 14, civil forerunner of the Hudson, was involved in a bad crash when a North West Airlines transport lost some parts of its tail, probably through ice deposition. This happening caused the tail design to be altered.)

The Lockheed company has been very faithful to its own





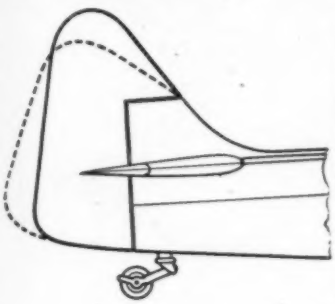
TWO ENGINES CUT. The original Boeing 307 Stratoliner in flight on only two engines and held straight by plenty of rudder. More fin area was found necessary and this was added experimentally as shown, but the production version was faired in with curves.

TAIL UNIT DESIGN

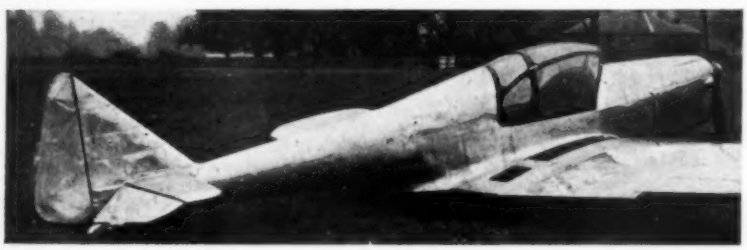
The short fuselage of the little Stinson 105 requires a large fin and rudder to give the necessary moment about the centre of gravity.

tail design and always has the fins set very far out on the tailplane, so far out that the small pieces of the tailplane outside the fins must be aerodynamically useless. Speculation on the reason for this design only gives one convincing answer, that it is the Lockheed "signature," somewhat akin to the Rolls-Royce car radiator. But it is considered that the plain "end plate" design is much more pleasing and efficient.

One reason for adopting the twin tail for twin-engined craft was to put the surfaces in the slipstreams of the engines and so give increased directional control. (But the General Aircraft Cygnet is twin-tailed though single-engined.) It should also be remembered that the polar moment of inertia of the tail unit is increased by using the twin tail design, as this puts the weight outboard from the fuselage and so tends to reduce the natural frequency of torsional vibration, a fact which makes "tail buffeting" when flying near the stall more likely to occur.



Rudder shape of the Miles Magister was altered to improve the spinning properties. It will be noticed that the later shape (shown in full line) is more efficient because of its higher aspect ratio.



TWIN-TAILED, SINGLE-ENGINED. The General Aircraft Cygnet is probably unique for it was improved by removing the vertical surfaces from the slipstream.

Another consideration in favour of the twin rudder is that the hinge moment of the two can be made smaller than that of a single rudder. This means a smaller load to be exerted on the rudder bar, an important consideration in the reduction of pilot fatigue, as only the very largest of aircraft have servo-controls (other than, of course, the almost universal servo-tabs).

Good spinning properties are not only a question of good tail design, for the viciousness or otherwise of the initial flick into the spin is largely a matter of wing characteristics. But it is the rudder which gets the machine out, and adequate rudder power must be provided for this purpose. This is not only a question of rudder area and distance of the rudder from the centre of gravity; it is also a question of an efficient rudder shape. This is well illustrated by the change of rudder on the Miles Magister, the change being made to improve recovery from the spin. With the new rudder recovery was effected in not more than 1¼ turns after even as much as 8 turns to right or left. (Loss of height in the spin was found to be at the rate of 250 to 290 feet per turn). Examining the rudder change, it will be observed that the new shape is better from the point of view of aspect ratio, though of approximately the same area.

Relative disposition of the tail surfaces can have much to do with spinning characteristics, and it is important to see that the verical surfaces are not "blanketed" by the horizontal ones. But decisions by eye on this matter are not reliable, and not even the ordinary wind tunnel testing is sufficient to settle such important questions. It is frequently necessary to use the vertical spinning tunnel at Farnborough to provide the answer.

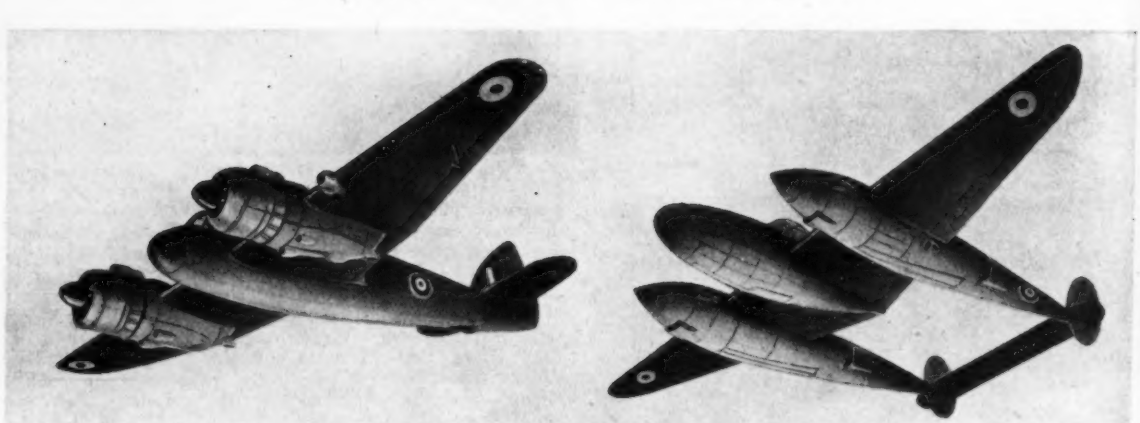
There is much to indicate that tail unit design has lagged behind other aeronautical work, but more effort has been applied to it of late, and it seems that it will be less of a "cut and try" business in the future.

THE ORIGINAL DOUGLAS DC-4 had fins and rudders of low aspect ratio, probably designed to these proportions so that they would not foul the top of the hangar door.

Twenty-eighth of the Series

FRIEND or FOE?

Two Twin-engined Fighters You May Not Yet Have Seen : The Beaufighter and the Lockheed Lightning

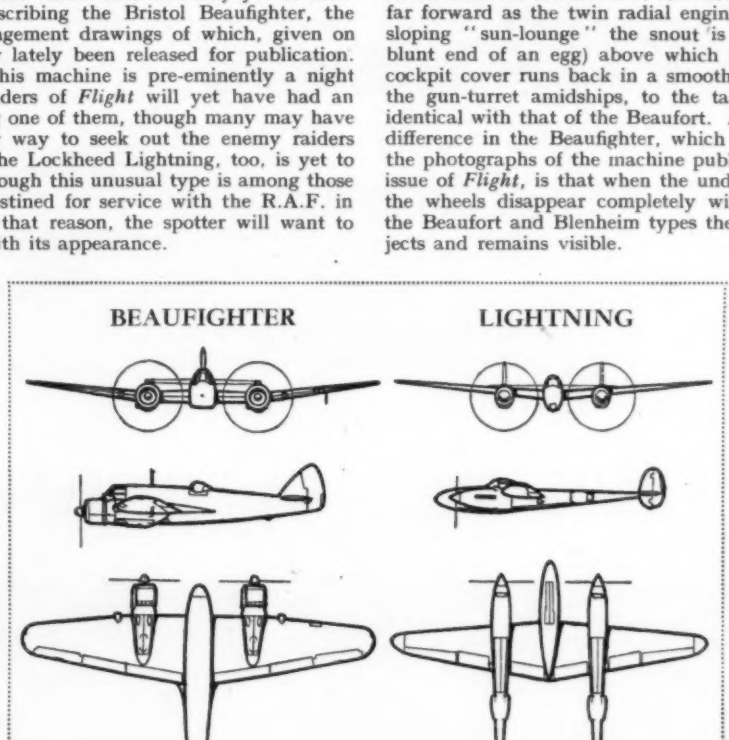


Bristol Beaufighter. Mid-wing tapers to small rounded tips; dihedral from centre-section. Twin radial engines. Fuselage has short, rounded nose and gun-turret amidships. Tailplane has straight leading-edge, tapered trailing-edge and rounded tips. Fin and rudder similar to Blenheim. Undercarriage retracts into nacelles.

Lockheed Lightning. Mid-wing, tapers sharply on trailing-edge to very small rounded tips. Double fuselage with in-line engines and air-scoops aft of trailing-edge. Nose of streamlined nacelle projects well forward; pilot's cockpit well back between wings. High aspect-ratio tailplane attached to fuselage tails carrying twin fins and rudders

NOTHING beyond visible externals may yet be mentioned in describing the Bristol Beaufighter, the general arrangement drawings of which, given on this page, have only lately been released for publication. As is well known, this machine is pre-eminently a night fighter, and few readers of *Flight* will yet have had an opportunity of seeing one of them, though many may have heard them on their way to seek out the enemy raiders in the night sky. The Lockheed Lightning, too, is yet to be seen over here, though this unusual type is among those American aircraft destined for service with the R.A.F. in due course and, for that reason, the spotter will want to familiarise himself with its appearance.

The best and quickest way to describe the Beaufighter is to say that it is typically "Bristol," with a strong family likeness to the familiar Blenheim 1. Any difference which may exist in overall dimensions is not sufficient to be observable in flight and so can be disregarded for the purposes of this article. As in the case of the Blenheim, the mid-wings have a dihedral angle from the centre section and taper in plan to fairly small rounded tips. The fuselage, however, is even shorter-nosed than the Blenheim 1, and does not project quite as far forward as the twin radial engines, and instead of the sloping "sun-lounge" the snout is streamlined (like the blunt end of an egg) above which a nicely faired pilot's cockpit cover runs back in a smooth line broken only by the gun-turret amidships, to the tail assembly, which is identical with that of the Beaufort. A small but important difference in the Beaufighter, which was clearly shown in the photographs of the machine published in the June 5th issue of *Flight*, is that when the undercarriage is retracted the wheels disappear completely within the nacelles; on the Beaufort and Blenheim types the lower periphery projects and remains visible.



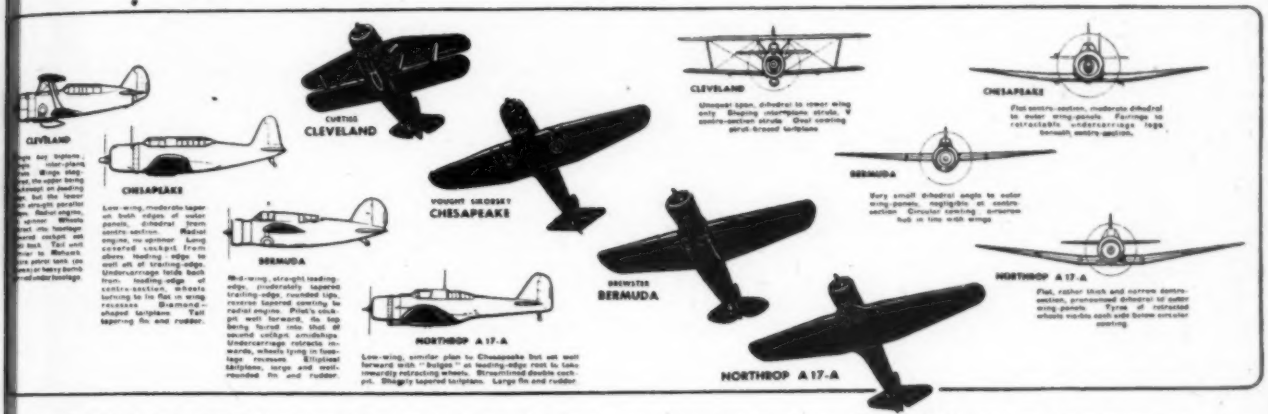
Apart from being also a twin-engined fighter, the Lockheed Lightning is a very different type of aircraft. Its main characteristic, in which it resembles the German Fw 189, is that it has twin fuselages with an in-line engine in the nose of each, the pilot being housed in a streamlined nacelle between the two. The mid-wing has a small dihedral angle from the nacelle, which projects well forward but terminates at the centre of the sharply tapered trailing-edge. There is also a

FRIEND OR FOE?

slight taper on the leading-edge and the tips are very small and rounded. The pilot's cockpit is well back in the nacelle, between the wings, and has a small transparent "glasshouse" cover. Each fuselage, which is really a streamlined continuation of the engine cases, provides for complete retraction of the undercarriage and has air-scroops on both flanks aft of the trailing-edge of the wings. The nose-wheel retracts into the nacelle. The high aspect-ratio tailplane joins the rear extremities of the double fuselage which terminate in oval fins and rudders. Performance figures quoted in America for the Lightning give a top speed in excess of 400 m.p.h., which would seem to justify its name.

Next week: The Maryland and the Baltimore.

U.S. DIVE BOMBERS OF R.A.F.



SUPPLEMENTING the data and illustrations of American fighters for the R.A.F. and Fleet Air Arm published in last week's issue, we give herewith corresponding particulars of four American dive bombers. The names given to these four types as used by this country are given first, and are followed by the corresponding American names or type numbers in parentheses. A fifth American dive bomber type has now been added: the Vultee Vengeance, which may be said to be a development of the Vanguard fighter described last week. It has a Wright Cyclone engine, and it is believed that it has been designed not only for high level speed but also for exceptionally high diving speed, a fact which should make it a very difficult target to hit when diving on its objective.

The drawings of the four dive bombers, and those of the fighters published last week, are included on the new *Flight* identification chart of American aircraft now on sale. So, too, are six heavy bombers and two flying boats, which we shall publish next week.

Curtiss Cleveland (Helldiver-77).—Two-seater single-bay biplane of all-metal construction, semi-monocoque fuselage. Upper wing has backswept leading-edge and is metal covered; lower has metal leading-edge, the rest fabric covered; single inter-plane struts; fixed tail surfaces metal covered, movable ones fabric. Manually operated metal, split trailing-edge flaps on lower panels. Wright Cyclone R-1820-G5 engine, 850 h.p. normal, 1,000 h.p. for take-off. Hamilton constant-speed airscrew. Undercarriage and tail-wheel retractable. Top speed, 235 m.p.h. at 15,000ft. Cruising speed, 176 m.p.h. Service ceiling, 24,500ft. Range at cruising speed, 855 miles. Dimensions: Span, 34ft. Length, 27ft. 6in. Wing area, 317 sq. ft. Wing loading, 19.7 lb./sq. ft.

Vought-Sikorsky Chesapeake (VS-156).—Low-wing, outer panels taper, rounded tips. Two-seater fuselage of welded chrome molybdenum steel tubing, aluminium fairing and fabric covering aft of cockpits. All-metal monospar wings, fabric covered aft of spar. All-metal trailing-edge flaps and tail group. Pratt and Whitney Twin-Wasp Jr., 750 h.p. at 9,000ft. Hamilton constant-speed airscrew. Undercarriage retracts backwards. Top speed, 257 m.p.h. Cruising speed, 227 m.p.h. Service ceiling, 28,200ft. Cruising range, 700 miles. Dimensions: Span, 42ft. Length, 34ft. Wing area, 305.3 sq. ft. Wing loading, 21.3 lb./sq. ft.

Brewster Bermuda (Model 138).—Mid-wing with moderate taper to rounded tips. Two-seater all-metal monocoque fuselage. Riveted aluminium alloy box-spar wing with integral fuel tank in centre-section. Metal-covered leading-edge, the rest fabric; manually operated split trailing-edge flaps. All-metal cantilever tail; fixed surfaces metal covered, movable fabric. Hydraulically operated retractable undercarriage. Wright Cyclone G-5 engine, 750 h.p. at 15,200ft., and 1,000 h.p. for take-off. Hamilton controllable pitch airscrew. Top speed, 302 m.p.h. at 17,000ft. Cruising speed, 226.5 m.p.h. Service ceiling, 30,000ft. Range at cruising speed, 776 miles. Dimensions: Span, 39ft. Length, 27ft. 9.5in. Wing area, 259 sq. ft. Wing loading, 20.8 lb./sq.ft.

Northrop A17-A.—Low-wing with moderate taper and pronounced dihedral to outer panels. Two-seater fuselage of light alloy monocoque construction and flush-riveted stressed skin. Wings are all-metal stressed skin except for fabric-covered ailerons. Cantilever tail group has fixed surfaces metal covered, but movable ones fabric. Split trailing-edge flaps. Pratt and Whitney Twin Wasp Jr. 825 h.p. engine. Top speed, 225 m.p.h. at 9,000ft. Cruising speed, 185 m.p.h. Ceiling, 20,700ft. Dimensions: Span, 47ft. 8in. Length, 31ft. 9in. Wing area, 363 sq. ft. Wing loading not stated.

Ford to Build Liberators

THE Ford Motor Company will build complete Consolidated B-24 Liberators at a new plant now being constructed at Ypsilanti, Michigan. The factory was designed originally as a parts factory, but provision was made for the easy addition of a very long assembly line, nearly a mile. Parts and perhaps complete engines will be turned out by the end of the year, it is reported. C. E. Sorensen, Ford manager, said that the plant is being designed to produce 270 bombers per month, but even though this is but a minute fraction of Mr. Henry Ford's figure of "1,000 aeroplanes a day," it is still a huge number and cannot be expected to be realised for a long time.

Wright Field Wind Tunnel

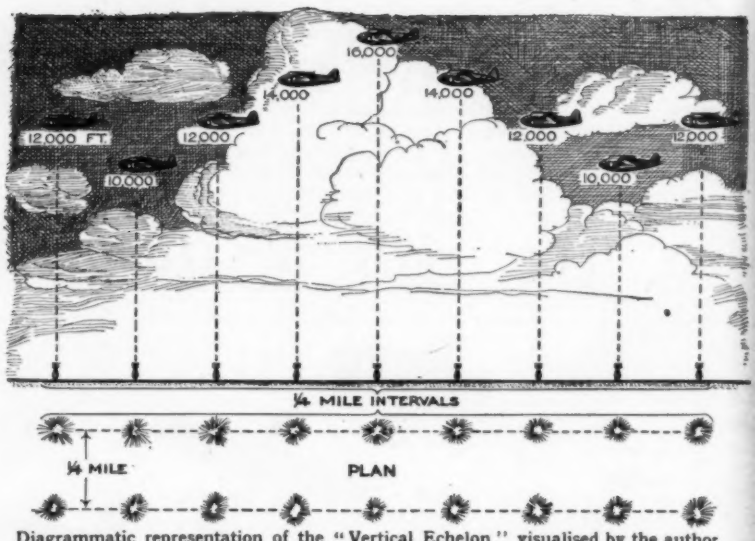
REQUIRING a 40,000 h.p. electric motor to drive it, the new U.S. Army Air Corps wind tunnel at Wright Field, Dayton, Ohio, is nearing completion. It is an open-jet closed-circuit type with a throat diameter of 20 ft. capable of taking models up to 15 ft. span or full size fuselages and engine nacelles. Two 40 ft. diameter airscrews circulate the air, and the tunnel at one point has a maximum diameter of 45 ft. Distance round the tunnel circuit is 616 ft. Maximum speed is reported as 400 m.p.h. and cost as £600,000.

BOMBING PATTERN

Some Suggestions for Improving Effectiveness by Vertical Echelon

By "ROSNEC"

"PATTERN BOMBING" is not new. The Germans tried to use it over London in their daylight raids, but Fighter Command rather spoilt the pattern, thus saving countless lives and much material damage. Whether the formation suggested could keep position in bad weather or in face of determined fighter attacks is open to argument



Diagrammatic representation of the "Vertical Echelon" visualised by the author The diagram is not to scale, nor would the bombs follow straight vertical lines. but they *would* strike nearly below the aircraft which dropped them.

ONE of the happiest of people in wartime is the armchair critic. He sits in comfort while others are doing anything but that, and he holds forth to his cronies, who know even less of his subject than he does himself, which is generally little or nothing. Most of what he says is purely destructive criticism, and as such is incapable or unworthy of serious answer. Having admitted so much, I am going to take my seat in my own armchair and hold forth in the approved manner, with a difference—all I have to say is constructive and put forward as humble suggestions for the consideration of those who matter.

A recognised method of bombing is that known as the "pattern method." A flight of aircraft in formation releases its bomb load simultaneously on receipt of a signal from the flight commander. The idea, of course, is that the target is surrounded by bombs, some of which may stand a better chance of scoring a direct hit than if independent aiming is practised by individual aircraft. The leader of the flight has taken the best aim he can; his error, if any, is likely to be compensated for by the widespread flock of bombs that joins his own. Whether this method is used at all under present conditions I do not pretend to know, but I am suggesting that a modification of it might play havoc with some Hun munition centres and townships.

If our aircraft flew in two parallel lines about a quarter of a mile apart each line consisting of, say, sixteen bombers, the result of their bombing would be a line of devastation nearly half a mile wide, perhaps a little less. I am, of course, allowing for blast effect as well as for direct explosive effort. The length of the line would depend on the interval between the aircraft in each line, which might be about a quarter of a mile to allow for A.A. fire, and also to make it uncomfortable for defending fighters to get in between any two aircraft of each line, or between the lines. Echelon formation is a well-known and commonly employed arrangement, but in addition to my horizontal in-line spacing I advocate echelon spacing in the *vertical* plane.

Thus if the leader flew at, say, 10,000ft., his immediate follower might be at, say, 12,000ft.; the next at 14,000ft.; the next at 16,000ft.; the next at 14,000ft.; the next at 12,000ft.; the next at 10,000ft.; and then upwards again to 16,000ft., and so on. This difference in height would have a confusing effect on the A.A. gunners and would be enough to allow of the harmless bursting of A.A. shells between the aircraft in both horizontal and vertical planes. A modification would be for the vertical echelon to be continuous—instead of descending after, say, 16,000ft., it might be continued upwards to within somewhere near the ceiling of the aircraft before a descent in the line began. Confusion of the A.A. height detectors is the essence of the scheme, and the slight difference of a few seconds in the time of fall of the bombs would be no disadvantage.

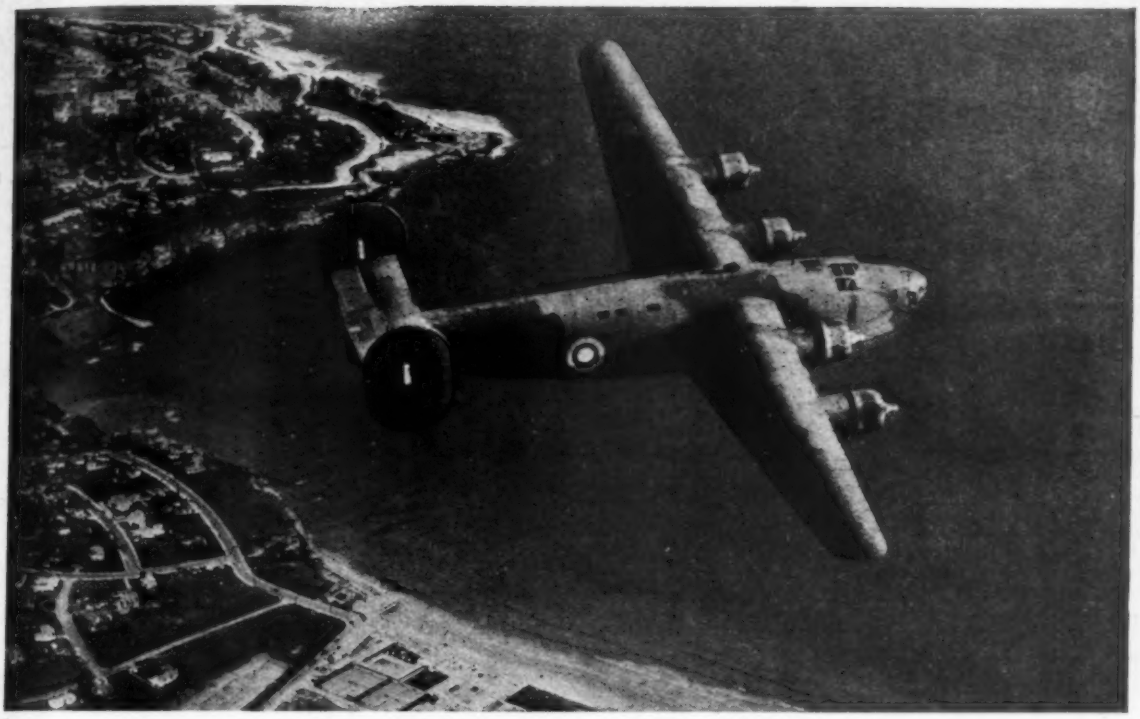
Imagine the effect of a flight of, say, 32 bombers in two lines of sixteen each, thus extending for four miles, dropping their bombs just as the leader had well passed the centre of Berlin. On the outward journey incendiaries would be the main present to Jerry; after a turn-round well beyond the town, which would take perhaps a quarter of an hour, allowing the civil defence services to get nicely working, the load of high explosives would be dropped on the return journey along the already blazing lines. Three such raids on three successive nights would make the centre of a town considerably less attractive than it had been, and each raid would, of course, be at an angle of, say, 60 degrees to its predecessor.

There would thus be six lanes of havoc crossing at a point which, unlike Euclid's, would have magnitude as well as position.

The theme is, of course, capable of variations. The length of the line, the spacing, the height and the numbers of aircraft engaged would not be kept constant, and the events of one night would not necessarily help the defence in meeting the next visit. If, however, defending aircraft showed too many signs of impertinence, a few long-distance fighters accompanying the bombers, and in a somewhat similar formation, should materially add to the night's bag.

SPEEDING THE ATLANTIC CROSSING

TO facilitate the transfer across the Atlantic of officials engaged on war work, the U.S. Army Air Corps has established a service with four-engined "de-militarised" bombers, either Boeing Fortresses or Consolidated Liberators. Though no official statement has been made, it is likely that the number of machines set apart for the service is two and that the route is direct, starting probably at Virginia and taking off for the water crossing from Newfoundland. The service, which is of vital importance to the war effort, will supplement the Pan-American Clipper route to Lisbon, this being quite unable to cope with all the traffic offering. It will also accomplish the trip between the States and England in much less time because of the directness of the route. The Clippers were originally routed to Lisbon because England was a "combat zone" within the meaning of the U.S. Neutrality Act, but the great changes which have occurred in the situation are evident from the fact that now even an American military aeroplane can land here. Distinguished people who have recently returned from U.S.A. in military aircraft are Mr. John G. Winant, U.S. Ambassador, and Mr. Griffith Brewer, president of the Royal Aeronautical Society.



A Consolidated Liberator leaving the coast of the U.S.A.

COMFORT and CONFIDENCE on LIBERATORS

By GRIFFITH BREWER

THE amazing President of the Royal Aeronautical Society, although well over 70, thinks nothing of a trip to the United States in wartime to visit his old friend Orville Wright. We have recorded several of Mr. Brewer's experiences in the past. Below we give his impressions of a flight from New York to Britain in a Consolidated Liberator.

AS previously reported in *Flight*, four-engined Liberators with tricycle undercarriages are flown across the American continent to Montreal and then proceed by Newfoundland, where they take off for the Atlantic flight. Catalina flying boats also cross the American continent to Elizabeth City, where they take off for Bermuda and alight on the water adjacent to Darrell's Island. This waterdrome was admirably chosen by Maj. R. H. Mayo, being located in the Bermuda lagoon with deep water all round, so that no matter what the direction of the wind the flying boats can approach to calm water under the lee of the island. This facility is most important in Bermuda, where high winds are frequent.

The two-engined Catalina boats are small compared with the four-engined tricycled Liberators, and much of the space in the Catalina hull is occupied by a huge tank carrying the extra fuel required for the Atlantic crossing. Their most marked differences compared with other flying boats are the retractable wing-tip floats and the gun blisters illustrated in *Flight* of May 22nd, 1941. The distance from Bermuda to the United Kingdom is greater than that of the hop from Newfoundland, requiring fuel for a 24-hour limit, instead of 15.

I should have liked to fly in a Catalina from the historic Elizabeth City over the Wright Memorial at Kitty Hawk to Bermuda, but no duty presented itself which would justify this experience. I was therefore fortunate to have a call in a still more interesting direction, and to find at an hour's notice that I should act as movable ballast along with eight American ferry pilots on a Liberator from Montreal to the United Kingdom.

I should have described this experience several weeks ago, but hesitated to do so for lack of precedent. Since then, however, Mr. Winant and Mr. Raymond Gram Swing have flown over on Liberators, so in describing my experiences I shall not be disclosing any unpublished data.

The body of the Liberator when standing on the ground is supported horizontally on three wheels, the front caster wheel looking absurdly soft on the hard runway. In fact, all three wheels appear to be softer than they really are, owing to the weight of the machine gradually sinking the tyres into the runway surface After a machine has stood for some time in one position it requires considerable force to move it out of the pockets which the wheels gradually indent in the ground. Actually, these machines standing in a row, it happened before we started that the next machine to ours was projecting out too much in front, so we were called to give it a push backwards—a matter of eight to ten feet—and it took the whole of our ballast passengers and other oddments to push it back and get the wheels to ride over the edges of the saucers they had made. Then, when the machine came to a standstill, it again settled down and made other saucers for its wheels.

We walked back to our own machine and entered by way of a two-step drop panel which, when down, made a stair entrance which could be lifted up from inside. Someone very kindly took my bag and carried it inside, and after that I followed. I found that the eight American ferry pilots who were to be my fellow-passengers were crawling forward on mattresses laid on the lower skin of the body. I crawled after them, attempting to go between two upright angles, but found my width too much, so I retracted and

The Liberator comes in to land with wheels and flaps down.

passed forward at the side. Our instructions were to go as far forward as possible, so we pushed forward to the bulkhead and lay tight up against each other. After the last man was in, the flap entrance was lifted, and we then felt something like Jonah must have felt inside the whale. There was an air-splitting buzz of some electric apparatus, which I took to be the electric gear for operating ancillary parts, such as retractable wheels.

The engines were already running when we entered, and now, in complete darkness except for a torch, we lay still and waited. The engines speeded-up, and we felt the wheels rolling on the runway. After a time the machine turned to the left, and then the engines speeded-up and with the old familiar roar we knew the take-off had started. I could not look at my watch to time it, but in less than a minute the land bumps ceased and shortly afterwards the electric screaming began again and we knew she was picking up her wheels.

We were then allowed to come out of the darkness, and we emerged into the entrance compartment. There were two high benches on opposite sides, covered with life-belts, and one could stand in the compartment or climb up on to the life-belts, when one got a view through small side windows. Better still by walking into the back compartment, where a flat deck gave room for several to stand, one could sit on the edge of the flat deck and put one's feet down a foot or so on to the lower continuation of the floor of the tail compartment. This afterwards became my favourite seat, because it was just forward of a glazed elliptical hole, and by sitting on the edge of the forward portion of the back compartment I could look down through that inverted skylight to the ground below and, by turning my head to right or left, could get a view through side windows laterally of the line of flight. When standing up other windows were available on the upper floor in the same compartment, or by going right into the tail you could have glass all round you, affording a view in every direction.

We flew along the St. Lawrence valley, the farms becoming fewer as we increased the distance from Montreal, and when we were over an L-shaped lake I noticed our left wing drop and round we came, only forty minutes after the start from St. Hubert. I knew what this meant, but did not tell my companions because, having made two returns to base before, I did not relish being regarded as a Jonah.

We learnt that we were ordered back because of snow on the runways in Newfoundland. An hour and twenty minutes after taking off we were shepherded into the dark cubby hole and lay comfortably on the mattresses, the wheels screamed down and we waited for the bump. When it came we looked at each other in mutual congratulation, for in our first tricycle landing there were no bumps which could have spilled a glass of water had one been set up for the test. We trooped out down the stairway and were told to be at the airport on the following morning at 8.15. For the third time I returned to Montreal from St. Hubert over the two-mile bridge and found only one of my hosts at home, the rest having gone to the country for the week-end.

The author of this article brings back fond memories of the old flying days by examining some of the souvenirs in his London office. He was a keen balloonist back in "the 'nineties."

At 7.30 on Sunday morning the taxi arrived and, having picked up two ferry pilots at the Queen's, we ran out in the crisp Canadian morning to St. Hubert and were on the spot, according to orders, at eight. Once more we crawled into the darkness and squeezed our human ballast forward between the angle framing and waited in perfect confidence for the second take-off.

Again we were in the air, this time in company with another Liberator and a Hudson. The farms gave place to the wild country of Maine and then to equally wild New Brunswick. In

COMFORT AND CONFIDENCE ON LIBERATORS

two hours the Gulf of St. Lawrence was reached and we were out at sea. Newfoundland came in sight, and, to my surprise, it seemed a land of snowy pimples which later gave way to black forest country and lakes. This wild country continued until, four hours after starting, we again crawled into our dusky den and waited in pleased anticipation for the landing. It was like landing on a billiards table. We crawled out and looked round, expecting to see the snow field which had turned us back the day before. Instead we saw a perfect Macadam surface with runways three hundred yards wide and not a speck of snow. We had left at 9 and landed at 1.30, a distance of over 900 miles, evidently with a tail wind.

After lunch we were ready to go at 6 p.m. and climbed into the body. The engines roared up and then stopped. We got out and were told the compression had failed. We stood about while the outer starboard engine was examined, and after considerable work it was found that the shaft of the ancillary pump had broken. Fortunately another was found, and the aircraft was again in flying condition.

We took off at 8.15, and then we came out into the two rear compartments. We were over forest land and soon approached the sea; the Atlantic that I had once before approached and crossed, but in a fog, on the airship *Hindenburg*. Now it was clear and getting cold.

We all wore flying suits, and some had overcoats lent to them. Having two coats myself, I lent the outer one to a ferry pilot; the flying suit then went on easily over my under-coat. I was happy for many reasons—going back to activity and to great expectations. Freedom to circulate and to smoke except in the cubby hole made up for the lack of seats; and there were cheery faces round me without a trace of anxiety on any.

Wrong Address

I was asked whether I knew the tailor who was to supply the Virginian's uniform, and found on the address that he was to get it at Bow Street. I assured him that from the address I should say it would be nearly a West End cut. Another American enquired about wartime food; yet another, younger than the rest, who had never been to England, asked about the beauty of the English girls, but I pleaded that I was out of date on both these subjects. It was like going back to school, not a soul on board being half my age.

As night approached and altitude was gained, the aft compartment became colder, and each ferry pilot made his bed on Kapok life-belts and rugs. I slept at intervals in assorted positions, with woollen pants wrapped round my Stetson, on the well-proved theory that to keep your feet warm you should wrap up your head.

The young hold the belief that the candle of life is nearly spent in the eve of life. I was pleasantly aroused by the wireless man coming to me with an invitation from the Captain to go forward to the control room to get warm. I followed him to the holy of holies over the sleeping pilots on the mattresses, hurting them as little as I could, and was given a seat behind the Captain, who was busy taking celestial observations with an aircraft sextant and plotting his readings on the chart.

The pilot having made some tests through the two-foot glass skylight, it was noiselessly hinged down and I looked up into the open black of the summer night. The open gap admitted no draught in spite of our speed of two hundred miles through the sparkling air. The sextant received the image of the chosen star and the pilot turned to mark his record, when the skylight closed as noiselessly as it had opened. This process was repeated, and our position in the heavens was noted with mathematical precision. How I envied the skill of that pilot! His was a job well worth while, and one that he enjoyed, while not forgetting the flickering candle to whom he had given refuge. The warmth of the control room and my intense interest in my hosts' doings warmed my heart and restored my flitting soul to normal. I sat silent for an hour watching and enjoying, and then completely refreshed proffered my deepest thanks and crawled back over the snoring sleepers to my observation post in the tail.

I did not want to sleep, I hated to miss any of that night's experience. Sitting on the floor step I kept warm and comfortable, but with full confidence in the aircraft personnel my mind was so completely relieved of care that I could not keep awake continuously, and I dozed off for ten-minute naps and woke after each nap refreshed to look around.

Dawn above the clouds brought back familiar memories of Gordon Bennett balloon days which, however, lacked the freedom from alertness for reason of the job then in hand. Now freed from all anxiety I could watch the dawn develop and experience the glow of the rising sun warming up the fuselage. Soon I had to discard my woolly head covering and next my borrowed flying suit. The warmth brought the hibernating pilots out to catch the first glimpse of the land of their ancestors, and the big Thermos flasks went round with early morning coffee. There's no drink like hot coffee at ten thousand feet on a summer morning when approaching home. It's pretty good on a balloon race, but not quite the same because one is getting farther from home all the time. But here I have to stop, for it is wartime. The label on my bag says "Brewer, U.K.," the shortest address in my experience.

At the airport the Americans enjoyed a good British breakfast, and in due time we were on our way to London, where I hope that the Bow Street tailor came up to the expectations of my enquiring friend and that the youthful ferry pilot was not disappointed in the fresh complexions of my friends in our beloved but somewhat battered old "home town."

SAFELY ON BRITISH SOIL: A Liberator shortly after its Atlantic crossing.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

SELLING THE ARMY

The Need for a Separate Air Force

AFTER the sad affair of Crete the daily and evening newspapers were full of "the lesson of Crete." Previously they were calling attention to the "lesson of Greece." Before this they were writing on the "lesson of Dunkirk," and earlier still the "lesson of Norway." It seems that we are constantly learning lessons, and that seems to be about as far as we go in the purely military aspect of this war.

In all these "lessons" we have been the unwilling pupil and our tutor the wily Hun. The last occasion on which we taught the Hun anything was in the 1914-18 war, when we showed him the tank. Since then the Hun has advanced with giant strides in military aeronautics and in mechanised armies, accompanied by new tactics and new technique, whilst we entered upon this war with a 1914 mind and armed and equipped for a resumption of the old trench warfare of those days.

For this we have to thank a small procession, over the past twenty years, of idealist Prime Ministers, preaching peace on earth and goodwill to men and turning a deaf ear to the many urgent warnings they received anent the military preparations afoot in Germany, and generally doing all they could (unwittingly, of course, poor men) to land us and the Empire well and truly in the soup.

Let this and succeeding generations always realise that, with the Hun, war is not only an exact science, it is also a religion. Whilst the Hun remains in Europe, war will be ever with us until the day the Hun reigns supreme. Then, and then only, will war cease, at least, as far as Europe is concerned. The Hitlerian and the Nazi dream is the "United States of Europe"—under Hun management, of course.

Approximately 50 per cent. of the world's present population can well remember the day when the fighting forces of every country possessing them consisted of an army and a navy. There was no air force, for the very simple reason that man had not then learned to fly. For the information of the young men of to-day, let us reiterate what is well known to their elders. The birth of aeronautics in this country saw it a purely military arm, belonging to, and administered by, the War Office.

That was the state of affairs up to and throughout the war of 1914-18. However, the opening year of that war showed the necessity for co-ordinating the functions of the Royal Flying Corps (as it then was) and the then Royal Naval Air Service. Consequently, for this and other reasons (principally connected with aircraft manufacture) the "Air Board" was set up. After that war the Air Board subsequently became the Air Ministry, out of which grew the Royal Air Force, as an independent fighting body, as we know it to-day.

What seemed an excellent idea in days of peace is not working so well in days of war. The Royal Air Force are busily engaged on a war of their own, i.e., bombing transports and enemy sea-going traffic generally, bombing docks, harbours, military works and industrial plants, bombing roads, railways and troop concentrations, etc., engaging enemy fighters, and doing their best to defend Britain against air attack and other enterprises of pressing urgency.

Such being the case, it is small wonder that General Sir Bren-Bofors, Commander-in-Chief of an army conducting an arduous and thirsty campaign in the desert of, let us call it (since there is no such place), Zenobia, has little or no air support, since what he did have originally was taken away from him for use on some pressing business elsewhere. Since his air support is under the control of the Air Ministry and not under the War Office, the valiant General can explode with wrath and bad language, and that is as far as he gets. The War Office are as powerless in the matter as he is himself.

Presently, the stay-at-home British public are shocked to hear over the wireless and to read in the papers that, after strenuous and bloody fighting General Sir Bren-Bofors has been surrounded and captured with all his staff; some of his beaten army have escaped over the frontier into, let us call it, Ypathia and have been interned. Thousands have been slaughtered and a far greater number taken prisoner, and all for the want of adequate air support.

Actually, this is just what is happening to-day, and the man-in-the-street and the armchair strategist unite in calling the General "a wooden-headed old ——," and make more sarcastic references to "glorious evacuations," etc., when actually there is nothing wrong with either the brains, the strategy, or the personal courage of General Sir Bren-Bofors or his staff. The trouble is solely due to a wrong system.

What the Army needs to-day is not a half-baked measure like the recently introduced "Army Co-operation Command." What it needs is just what it had in the war of 1914-18—i.e., an Air Force of its own, under the direct administration of the War Office. Naturally, this Military Air Force would be a separate entity, as distinct from the Royal Air Force as is the Fleet Air Arm to-day. It means a still greater burden on the groaning tax payer, but he will gladly stand an addition to his already heavy load if it will (as it doubtless would) help to put a check on our lamentable succession of military "reverses," as we call our defeats. It is high time our politicians gave this aspect of the case their urgent attention. The need for complete reorganisation on the purely military side of aeronautics is pressing.

E. V. HAMMOND.

TWIN-ENGINED INSTALLATION

Some Alternatives Examined

THE hope expressed by a correspondent in *Flight* on June 5th that further discussion would result from his letter on the elimination of side-thrust has prompted me to submit the following remarks.

The elimination of side-thrust due to the failure of one of the motors of a twin-engine aeroplane may be effected by several means. The most favoured method appears to be that of positioning the two motors as close to the longtitudinal axis of the aircraft as possible in order that the plane may continue flight in as nearly similar a manner to a single-engined aircraft as possible. Good illustrations of this are provided by the Consolidated "Catalina" and the Grumman "Skyrocket." It would appear that the design of these aircraft was influenced by the fact that they would be operated mostly over water and therefore they should be provided with two motors so disposed as to render flight as favourable as possible if one stopped. For an aircraft required to perform ocean-patrol duties the Dornier 18K layout appears to be most suitable, as the two motors in tandem are both on the thrust line and a reduced drag is also incurred. Whether the "Catalina's" two radial motors could be so arranged to advantage is a debatable point, due to streamlining and cooling difficulties.

The Dornier 17 (or 215) provides another example of an attempt to solve the problem. The thin fuselage facilitates the close concentration of the power-units to the centre line. The major assistance is provided by the counteracting effect of twin rudders placed at a relatively great distance from the airscrews, resulting in a greater effective correcting moment. Some drift with such an arrangement is, of course, inevitable, but the Dornier 17 layout attempts to reduce it to a small degree.

Yet another example is embodied in the Fokker D.23 with two engines of 700 horse-power apiece. The power plant is installed in a central nacelle, and the empennage is supported by twin booms extending from the wings. Both the motors are on the longitudinal axis and therefore no yawing effect is experienced in the event of a single-motor failure. As the airscrews revolve in opposite directions torque is eliminated, with beneficial results to manœuvrability at high speeds. Incidentally, a fighter type possessing many apparent advantages is suggested by the Fokker D.23. A layout including a central nacelle containing a 2,000 h.p. engine with extended shafts driving two airscrews revolving in opposite directions would form the basis. The tail-booms could contain the armament. Such a plane would possess enhanced fighting potentialities, due to the virtual elimination of torque, the placing of the engine at the centre of gravity to assist manœuvrability and a tricycle undercarriage as an aid to landing at high speeds, especially at night.

A modified version with a superior view for the pilot is suggested by dispensing with the forward screw and substituting a nose cockpit, and having rear counter-rotating propellers to absorb the horse-power and cancel out torque.

ROYSTON G. POWELL.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

"Late Arrivals" Club

A CLUB, exclusive as it is unique, has just been formed in the Western Desert. It is called "The Late Arrivals Club" and the members are a small body of fliers who have been shot down in action and have, through initiative and courage, managed to elude the enemy and gain the safety of their own lines.

The members include a D.S.O. and many D.F.Cs. There are one or two Free French eligible, and at least three South Africans. Some members are doubly eligible having thwarted the enemy on more than one occasion. The "Late Arrivals" sport a badge designed in blue and white enamel, and consisting of a winged flying boot signifying that most members of the club have walked back from behind the enemy lines.

Awards

THE King has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

BAR TO THE DISTINGUISHED SERVICE ORDER.

Act. Wing Cdr. A. G. MALAN, D.S.O., D.F.C.—This officer has displayed the greatest courage and disdain of the enemy whilst leading his wing on numerous recent operations over Northern France. His cool judgment, exceptional determination and ability have enabled him to increase his confirmed victories over enemy aircraft from 19 to 28, in addition to a further 20 damaged and probably destroyed. His record and behaviour have earned for him the greatest admiration and devotion of his comrades in the wing.

During the period of one fortnight recently the wing scored heavily against the enemy with 42 hostile aircraft destroyed, a further 15 probably destroyed and 11 damaged.

BAR TO THE DISTINGUISHED FLYING CROSS.

Act. Sqn. Ldr. J. C. MUNGO-PARK, D.F.C., No. 74 Squadron (since reported missing).—This officer has performed excellent work in his many engagements against the enemy and has destroyed at least twelve of their aircraft. In June, 1941, he was attacked by six Messerschmitt 109's while over the French coast. He succeeded in shooting down two of these, and, although his own aircraft was badly damaged, Sqn. Ldr. Mungo-Park flew back to this country, making a skilful forced landing. His courage and leadership have contributed materially to the successes achieved by his squadron.

P/O. W. VALE, D.F.C., No. 80 Squadron.—Following the evacuation operations from Greece, this officer remained at Maleme aerodrome with some members of his unit. In the course of preliminary enemy air attacks on objectives in Crete, P/O. Vale proved himself to be a staunch pilot. Frequently against odds, he continued his attacks against the enemy and destroyed four of their aircraft during an attack on the anchorage at Suda Bay. He displayed great courage and determination.

DISTINGUISHED FLYING CROSS.

Sqn. Ldr. J. RANKIN, No. 92 Squadron.—Since March, 1941, this officer has led his squadron in operations over the Straits and Northern France, in the course of which he has destroyed at least nine enemy aircraft and also damaged one of their trawlers. He has displayed excellent qualities of leadership and a high standard of courage which is reflected in the fact that recently, within the space of twelve days, he has destroyed six enemy fighters. Two of these were shot down in flames within one minute. He has been an inspiration to his fellow pilots.

Sqn. Ldr. J. R. WILSON, No. 208 Squadron.—This officer has commanded the squadron since December, 1940. During the advance in Libya, his unit provided full and most efficient cooperation with the army under extremely difficult conditions. By his splendid example and leadership, Sqn. Ldr. Wilson contributed materially to the successes achieved in Libya, Greece and, latterly, in Syria.

Act. Sqn. Ldr. P. H. ALINGTON, R.A.F.O., No. 230 Squadron.—This officer has acted as captain of a Sunderland aircraft since the outbreak of the war. In December, 1940, he assumed command of the squadron and, by his outstanding ability and leadership, has set and maintained a high standard of efficiency. He has carried out many long reconnaissances and, during the evacuation from Greece, displayed boundless energy in organising the Sunderland detachment, and finally taking a re-fueller motor boat with several personnel from Athens to Crete via a port in the Peloponnesus, where valuable work was carried out in ferrying personnel to a destroyer.

The voyage could only be carried out at night owing to enemy air activity, but, in spite of many difficulties the passage to Suda Bay was safely accomplished. The arrival of the boat there eventually made it possible for a valuable re-fuelling ship to sail for Egypt. Sqn. Ldr. Alington, though in an unfit state of health at the time, displayed great determination and devotion to duty throughout the operation.

Act. Sqn. Ldr. L. G. SCHWAB, No. 112 Squadron.—This officer has led his squadron in combat against the enemy with considerable skill and has personally destroyed eleven of their aircraft. He has displayed great courage and determination.

Flt. Lt. A. S. B. BLOMFIELD, No. 211 Squadron.—Throughout the many operational flights in which he has participated, this officer has displayed courage and leadership of a high order. He has led the squadron on many occasions.

Act. Flt. Lt. A. FRAME, No. 228 Squadron.—This officer has completed a large number of operational missions since the war began. On one occasion, operating from this country, he carried out a patrol in search of five enemy ships which entailed a flight lasting for thirteen and a half hours. Since December, 1940, he has performed excellent work in the Mediterranean zone of operations. During the evacuation from Greece, Flt. Lt. Frame operated with great success and was responsible for the safe evacuation of over 200 personnel by air. Throughout he has displayed great skill, courage and devotion to duty.

F/O. J. D. BISDEE, R.A.F.V.R., No. 609 Squadron.—This officer has led his flight and section with great skill and determination. He has participated in a large number of operational flights against the enemy and has destroyed at least six of their aircraft, besides damaging many others. He has set a fine example.

F/O. A. K. OGILVIE, No. 609 Squadron.—This officer has displayed great keenness and determination in his efforts to seek and destroy the enemy. He has shot down at least five hostile aircraft.

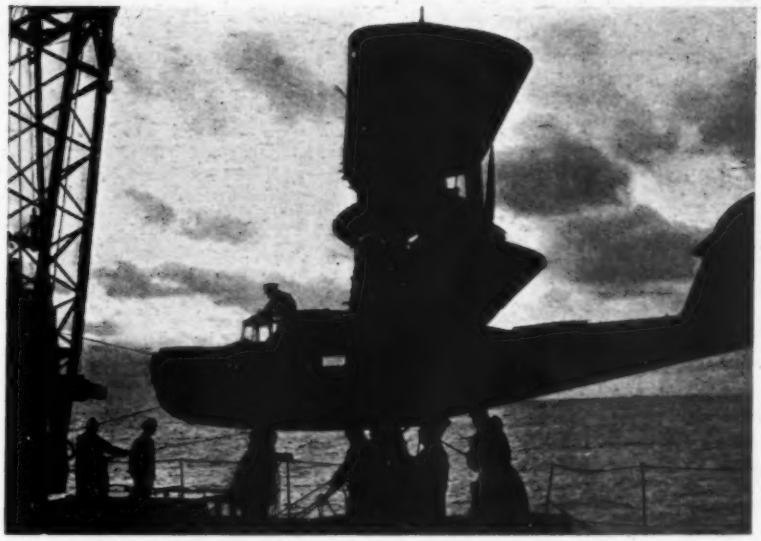
Flt. Lt. R. W. WHITTOME, R.A.F.V.R., No. 202 Squadron.—In June, 1941, Flt. Lt. Whittome was the captain and Sgts. Mills, Turnbull and Wharton the air gunners of a Catalina aircraft which, in the course of a convoy escort operation, was attacked by four enemy aircraft. With great skill, Flt. Lt. Whittome manœuvred his aircraft and enabled his air gunners to attack the enemy aircraft as they endeavoured to drop bombs on the convoy.

The enemy were finally compelled to break off the attack. Although his aircraft was damaged, Flt. Lt. Whittome carried out his protective duties to a successful conclusion. He has completed 100 operational missions and has always shown the greatest efficiency and devotion to duty. Sgts. Mills, Turnbull and Wharton displayed determined, courageous and effective gunnery throughout.

DISTINGUISHED FLYING MEDAL.

Sgt. E. W. MILLS, Sgt. J. TURNBULL, Sgt. E. WHARTON, all of No. 202 Squadron.—For citation see Flt. Lt. Whittome, above.

A/C.1 K. E. W. CLIFTON, No. 4 Service Flying Training School.—In May, 1941, this airman was the air gunner of an aircraft engaged in a reconnaissance flight over Ramadi in the course of which the pilot was shot and fell across the controls. A/C. Clifton felt the aircraft lurch and looking forward saw the observer trying to regain control. He immediately scrambled forward and, assisted by the observer, succeeded in removing the pilot from his seat. Although A/C. Clifton had not received any flying training, he took over the controls and flew the aircraft back to his base where he accomplished a safe landing at the third attempt, without damage to the aircraft. This airman displayed great courage and resource.



FLEET AIR ARM SILHOUETTE: A Walrus being hoisted inboard on H.M.S. *Suffolk* at the end of a reconnaissance flight.

HIS LUCKY DAY: The Captain of the Catalina who found the *Bismarck* after it had eluded the shadowing naval craft. More than twenty hours elapsed between take-off and landing.

Roll of Honour

THE Air Ministry regrets to announce the following casualties on various dates. The next-of-kin have been informed.

KILLED IN ACTION (WHILE FLYING IN OPERATIONS AGAINST THE ENEMY).—Sgt. C. J. Barton; Sgt. E. A. B. Beadman; Sgt. G. Billing; Sgt. H. S. Blackwell; Sgt. R. W. Body; Sgt. J. H. Chesman; Sgt. J. Cousins; Sgt. L. H. Harrap; P/O. S. J. Hill; Sgt. W. Innes; Sgt. E. M. Kelsall; Sgt. R. F. Lyle; P/O. J. R. Periwee; F/O. N. W. Pinnington; Sgt. C. F. Ranson; P/O. R. L. Roberts-Brown; Sgt. D. Rolfe, Sgt. W. G. Roper; P/O. K. H. Rowlands;; Sgt. P. D. Sargent; Sgt. D. R. Simm; P/O. A. V. Snelling; Sgt. J. B. Stevens; Sgt. G. Stubbs; Sgt. L. S. Tipper; Sgt. J. S. Tomkinson.

PREVIOUSLY REPORTED MISSING, BELIEVED

SERVICE AVIATION

KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. A. E. Brian; Sgt. A. G. Coster; L.A/C. L. D. Davies; F/O. W. N. Gray; Sgt. J. B. C. Jago; Sgt. F. M. Jarrett; Sgt. J. H. Keddie; Sgt. C. W. Laughton; Sgt. P. E. M. Mertens; Sgt. D. Philip; Sgt. A. W. Ross; F/O. H. U. Sykes; Sgt. G. S. Wilson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. C. S. F. Boer; Sgt. R. C. Bishop; Sgt. L. B. Breeze; Sgt. H. W. Brook; Sgt. D. Bruce; F/O. A. A. Campbell; Sgt. W. H. Cassells; Sgt. W. Cave; Sgt. S. C. Chester; P/O. H. M. Christopher; Sgt. F. A. Core; Sgt. R. Cox; F/O. L. M. Craigie-Halkett; Sgt. H. Dean; P/O. C. B. Dove; Act. Flt. Lt. J. C. Dundas, D.F.C.; Sgt. F. R. Elton; Sgt. G. H. Emery; Sgt. S. W. J. English; P/O. L. J. E. Ewing; A/C.2 J. A. C. Finlayson; Act. Flt. Lt. F. W. Flood; Sgt. A. J. W. Friend; Sgt. T. W. Gostick; Sgt. G. Graham; Sgt. J. Gray; F/O. J. A. Gray; Wing Cdr. S. R. Groom; P/O. R. G. Hall; L.A/C. J. Hislop; Sgt. C. P. Hoare; Sgt. L. Hogarth; Sgt. R. V. Hogg; Sgt. H. A. Hogger; Wing Cdr. C. G. Hohler; Sgt. G. Holliday; Sgt. G. F. Hurworth; Sgt. A. Hyam; Sgt. R. C. Hyland; Sgt. F. E. V. Johnson; P/O. J. R. Kemp; Sgt. D. E. Larkman; Sgt. A. A. Meadows, D.F.M.; Sgt. C. W. Minn; Sgt. F. L. Moore; Sgt. M. B. Mott; Sgt. J. Murray; Sgt. A. W. Norman; Sgt. P. P. O'Regan; Sgt. F. A. Parton; Sgt. L. J. Patterson; P/O. E. R. M. Pears; Sgt. V. W. Peglar; P/O. L. S. Roberts; P/O. A. Robson, D.F.C.; Sgt. R. Rodger; F/O. A. M. L. Selby; Sgt. E. A. Shapland; Sgt. G. Simpson; Sgt. J. E. Sneeston; Act. F/O. E. D. Stevens; Sgt. V. G. Sullivan; Sgt. A. E. Taylor; Sqn. Ldr. R. O. O. Taylor; Sgt. T. Thomas; Sgt. S. G. Twitchin; Sgt. J. A. Wallace; Sgt. J. C. Walton; Sgt. C. J. Watts; Sgt. H. Whelpton; Sgt. R. J. Willcox; F/O. G. C. B. Woodroffe.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Sgt. J. Hall; P/O. C. F. Page.

PREVIOUSLY REPORTED PRISONER OF WAR, NOW REPORTED KILLED IN ACTION.—Sgt. T. E. Girvan; Flt. Sgt. G. P. Moore.

WOUNDED OR INJURED IN ACTION.—P/O. J. P. Geoghegan; Sgt. F. Hamblen; P/O. A. J. W. McBarnett; P/O. A. J. Reeves; F/O. G. S. P. Rooney, D.F.C.; Sgt. E. Tuck.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. J. D. Decent; Flt. Lt. J. E. McFall, D.F.C.; Sgt. H. I. Oddy.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. D. G. Campbell.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. L. Boham; Sgt. D. J. R. Craig; Wing Cdr. H. R. Dale; Sgt. D. E. R. Ellwood; P/O. D. H. Gage; Sgt. G. T. Hardwick; Sgt. W. F. Hodson; Sgt. G. MacLean; F/O. K. E. Macrostie; Sgt. P. G. Marsh; Sgt. H. J. Mew; P/O. R. H. MacK. Munroe; Sgt. N. R. Newey; Sgt. I. B. Oultram; F/O. J. Robinson; Sgt. J. Rowe; Sgt. S. G. White; Sgt. C. S. Wynn.

MISSING.—Flt. Lt. J. R. Aldis; Sgt. C. C Ashcroft; Sgt. J. E. Austin-Johnston; F/O R. W. Ayres, D.F.C.; Sgt. E. G. Baker; Sgt. A. Ball; Sgt. G. K. Bass; A/C.1 A. Bell; P/O. P. R. S. Bird; Sgt. L. B. Box; Sgt. S. B. Bransby; P/O. C. W. S. Bristow; L.A/C. R. E. Brodie; P/O. P. R. B. Brown; P/O. W. A. Brown; Cpl. D. E. Buchanan; Sgt. E. G. Buckingham; P/O. W. W. Burgon; Flt. Lt. N. W. Burnett; A/C.1 G. Burwell; L.A/C. J. Cassidy; Sgt. G. T. Cheetham; L.A/C. D. R. Cherry; A/C.1 B. W. Collett; P/O. I. B. Cooper; A/C.1 T. Craven; Sgt. P. W. Crump; Sgt. F. A. Colham; L.A/C. N. J. Darch; P/O. H. N. M. Daston; Cpl. C. G. Day; Sgt. J. T. Donnelly; A/C.2 G. D. M. Dow; Flt. Lt. H. C Down; P/O. N. C. Downie; Sgt. G. M. Duffus L.A/C. E. Dullaghan; L.A/C. J. Edwards; Sgt. I. C. Elson; Sgt. G. A. Fairbank; L.A/C. W. W. Fenton; F/O. W. A. Foster; A/C.1 C. P. France; Flt. Lt. R. W. Gautrey; Cpl. C. W. Gerrard; P/O. J. Gill; Cpl. A. B Gillan; Sgt. C. R. Glover; A/C.1 M. S. Goodhand; P/O. R. L. Goord; Sgt. S. Gordon; Sgt. I F. Gow; L.A/C. J. R. B. Green; Cpl. H. Gulliver; P/O. A. J. C. Hamilton; Sgt. W. P Hannigan; Cpl. J. S. Harrison; Sgt. R. A Hewlett; P/O. P. B. Hodgson; Sqn. Ldr. E. A. Howell; Sgt. G. V. Hoyle; A/C.2 W. P. Hutchinson; Sgt. K. J. Hutt; Sgt. H. P. Jeudwine; Sgt H. Jones; Sgt. D. G. Keane; Sgt. G. M. Kerr; Act. Wing Cdr. G. S. King; Sgt. N. B. Lake; Act. Sqn. Ldr. E. Langebeer; Cpl. R. J. Lawrence; Sgt. G. Leather; P/O. I. A. Lees; Sgt. L. Littlefair; Sgt. W. B. Longstaff; A/C.2 H. Lye; A/C.1 H. S. McKeown; F/O. M. Mackenzie; Sgt J. H. Maletich; L.A/C. J. S. Mantle; P/O. K. G. A. Marsh; Sgt. C. H. Martin; Sgt. J. R Massey; Flt. Lt. I. A. Mead; Sgt. C. Meredith; P/O. P. Molloy; L.A/C. J. Mooney; Sgt. T. Morley; Sgt. J. W. Mullen; P/O. W. E. Myhill; Sgt. H. T. Naughtin; Sgt. A. K. Newberry; L.A/C. C. A. M. Nichols; Sgt. P. N. Nutt; Sgt. N. H. Nuttall; Sgt. R. Ogdroyd; Sgt. T. C. Osborne; L.A/C. J. T. Oswald; Sgt. D. Owen; Cpl. J. H. Palmer; Sgt. J. A. A. Parker; Sgt. L. Parry; L.A/C. A. F. W. Pearson; A/C.1 E. G. Pendegrass; L.A/C. E. Penniceard; Sgt. D. A. Philipson; Sgt. S. P. Plumb; L.A/C. F. E. Poole; Sgt. R. G. Pyatt; A/C.1 H. A. Ralph; Sgt. W. F. Richards; A/C.1 L. Roome; P/O. M. A. Scott; F/O. C. MacK. Scrutton; A/C.2 S. Sellers; Sgt. L. A. Slade; A/C.2 M. Slor; Sgt. F. A. S. Smith; A/C.1 J. V. C. Smith; L.A/C. W. L. Spalding; L.A/C. R. G Stone; Sgt. A. A. Sutton; Sgt. J. R. Taylor; Sgt. W. G. Thorneycroft; L.A/C. W. H. Trinder; L.A/C. R. Tweddle; A/C.2 C. A. Underwood; Cpl. K. E. Wake; A/C.1 C. Wickendon; Sgt. H. Wilkinson; L.A/C. L. C. Wilkinson; Cpl. F. T. Williams; L.A/C. D. M. Williamson; Sgt. F. Wood; Cpl. J. Woods; Sgt. H. Young.

PREVIOUSLY REPORTED PRISONER OF WAR, NOW REPORTED MISSING.—L.A/C. T. W. Brown; Sgt. P. McK. Southwood.

MISSING, BELIEVED KILLED, ON ACTIVE SERVICE (WHILE ENGAGED ON NON-OPERATIONAL FLYING DUTIES OR ON THE GROUND THROUGH ENEMY ACTION).—Sgt. J. H. Adamson; F/O. G. W. Arthur; Sgt. W. G. S. Austin; Sgt. J. Charlesworth; Sgt. J. Christie; L.A/C. O. Cumins; L.A/C. J. W. Dixon; L.A/C. K. A. Eaton; A/C.1 A. B. Elder; A/C.1 J. Elder; Flt. Sgt. K. G. Fridd; L.A/C. T. Froggatt; A/C.1 D. W. Gibson; Sgt. E. D. Glyde; A/C.1 S. G Gurney; A/C.1 G. Johns; A/C.1 L. F. Kerr; Cpl. R. O. Lenham; Flt. Lt. G V. Nicholls; L.A/C. C. F. Quilliam; Sgt. J. M. South; Flt. Sgt. K. H. Squire; L.A/C J. B. Steedman; Cpl. R. W. Strong; L.A/C. T. W. F. Sturman; L.A/C. D. I. Thomas.

KILLED ON ACTIVE SERVICE.—Flt. Lt. J. A. Allen; Sgt. D. G. Ambrose; L.A/C. D. C. Ballance; Sgt. C. R. Bateman; Sgt. I. K. J. Bidgood; Sgt P. H. Boulton; L.A/C. R. C. Burbidge; L.A/C V. Collins; L.A/C. H. G. Cook; Flt. Sgt. J. T Craig, D.F.M.; L.A/C. W. Cummings; P/O J. C Cunningham; Sgt. J. E. F. Dobbs; L.A/C. J. J. Duhamel; Sgt. A. M. Duthie; A/C.2 A. H. Fellows; P/O. R. F. Ferdinand; Sgt. D. L. Forbes; Sgt. W. Hall; L.A/C. J. T. Harrison; Sgt. S. N Hawke; P/O. D. E. S. Hawkins; L.A/C. G. S Hendry; Sgt. P. F. Hollely; Sgt. H. I. Holroyd; P/O. P. F. Jackson; Sgt. L. Jones; A/C.1 C. G. Latham; Sgt. P. A. L. Lowe; P/O. W. G. McDowell; Sgt J. A. Milsom; A/C.2 A. W. Neck; L.A/C. W. R. Newton; L.A/C. W. W. Parkinson; Sgt. R. G. Pascoe; A/C.2 H. P. Patterson; L.A/C. E. F. S Penney; P/O. D. L. Pethick; L.A/C. C. J. H. Philipson; L.A/C. J. S. E. Rawcliffe; F/O. A. H. C. A. Rawson; A/C.2 A. J. Sharp; Sgt. J. T. Smale; L/A.C. F. Taverner; Cpl. D. S. Temple; P/O. A. J. E. Thorne; Sgt. G. C. Trelawny; Sgt. J. G. Turnbull; A/C.2 W. Vickers; L.A/C. E. Walton; A/C.1 M. V. Whitehorn; F/O. R. H. Wiens; F/O D. A. Willans; L.A/C. E. V. Williams; A/C.1 F. W. Wilson; P/O. G. V. Wilson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED, ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. C. G. Birch; F/O. A. W N. Britton; Sgt. B. Butler; Sgt. S. Butler; Sgt. N. Gaskell; Sgt. T. Graham; A/C.1 R. Howell; Sgt. T. C. Illingworth; Sgt. D. G. Johnson; Sgt. A. St. J. Lilley; A/C.2 H. K. Lockett; Cpl. R. P. W. McMahon; A/C.2 S. A. Sidlin; P/O. R. Vevers; A/C.2 H. S. Wheelhouse; Sgt. D. Williamson; A/C.1 L. T. Winsborrow; A/C.1 A. Wood.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.2 B. R. Cannar; A/C.1 T. A. Hayes; Cpl. G. H. Rigby.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.1 A. G Andrews; P/O. C. H. Arnison, M.C.; A/C.2 G. Buchan; P/O. M. A. Coote; A/C.2 T. Delaney; Sgt. B. E. Farr; A/C.1 A. Foster; A/C.2 T. W. Gilmour; L.A/C. R. C. Griffiths; Wing Cdr. J. A. P. Harrison; P/O. J. M. Hill; L.A/C. F W. R. Hutchinson; L.A/C. C. James; Cpl. T. E. Litherland; Sgt. F. J. F. Lucie; A/C.2 J. S. McLeod; Sgt. A. W L. Mahon; Sgt. I. C. A. Morris; Cpl. S. Oakley; A/C.1 D. Pottie; Sgt. W. F. Read; Sgt. D. B. Richardson; A/C.2 F. G. Smith; Sgt. L. F. Stuart; Cpl. J. B. C. Swinney; Sgt. S. S. S. Ward; Sgt K. Williamson; Sgt. H. P. Woodward; L.A/C. G. S. Wright.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. B. Davey; Flt. Lt. D. W. Mahon; A/C.2 F. N. L. Payton; Sgt. E. Weller; Sgt. G. MacG. Young.

PREVIOUSLY REPORTED WOUNDED OR INJURED ON ACTIVE SERVICE, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. J. R. Perkins.

DIED ON ACTIVE SERVICE.—L.A/C. G. Burwood; Sgt. J. A. S. Cope; A/C.2 C. Craven; L.A/C. D. J. Davies; L.A/C. T. A. Dunwoody; L.A/C. D. Ellis; Flt. Lt. J. Fanning, M.B.E.; A/C.1 G. R. Farmer; Sgt. D. N. Fielding, D.F.M.; A/C.1 S. Godley; A/C.2 E. J. Griffiths; A/C.2 E. Howarth; A/C.1 A. B. Johnson; L.A/C. J. S. Jones; Flt. Lt. H. J. Lyon; A/C.2 W. N. Mackintosh; A/C.2 A. Marshall; A/C.2 J. R. Melling; Sgt. F. W. Rogers; A/C.1 A. C. E. Smith; L.A/C. A. Smith; Cpl. H. T. Sparkes; A/C.2 C. L. Stevens; A/C.1 A. G. Tressider; A/C.2 H. B Wetton; LA/C. R. F. White-Saunders; L.A/C. T. L. Williams.

PREVIOUSLY REPORTED MISSING, NOW REPORTED SAFE.—Sgt. F. C. Daniels; Sgt. C. H. Kemp; Sgt. J. E. Howard; Sgt. L. A. Ward.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. P. Addison; Sgt. C. W. Carter; Sgt. O. R. L. Cox; Sgt. L. Hudson; Sgt. J. K. Scouller.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. P. Field.

KILLED ON ACTIVE SERVICE.—Sgt. A. B. Hale; L.A/C. R. V. Hibbs; Sgt J. M. Opie.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. L. D. Dougherty; Sgt. A. Hicks.

MISSING.—Sgt. F. Boroski; Sgt. G. A. Bye; Cpl. R. S. Collis.

MISSING BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. J. F. Cranston; Sgt. S. J Tyson.

KILLED ON ACTIVE SERVICE.—Sgt. A. R. Cameron; Sgt. A. W. Carty; Sgt. J. H. Cooper; P/O G. R. Cushon; Sgt. G. E. Halstead; Sgt. J. M MacDonnell; Sgt. J. P. Taylor.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. Morrison; Sgt. H. E. Weir.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. D. G. Callender; Sgt. N. F. Dixon; P/O. H. F. Irving; Sgt. E. J. Kean; Sgt. H. S. Latta; Sgt. H. O. Turner; Sgt. B. A. Walker.

WOUNDED OR INJURED IN ACTION.—P/O. E. W. G. McKenzie.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. H. N. Goodall.

MISSING BELIEVED KILLED IN ACTION.—P/O. D. McL. Campbell; Sgt. R. W. Finlayson.

MISSING.—Sgt. E. R. Lucas.

MISSING BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. C. J. Salt.

KILLED ON ACTIVE SERVICE.—Sgt. G. B. Johnson.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. F. E. Croker.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. D. C. B. Jenkins.

South African Air Force

KILLED IN ACTION.—Lt. R. H. Talbot.

KILLED ON ACTIVE SERVICE.—Lt. P. de J. Fritz.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Lt. G. Heller

U.S. ARMY BARRAGE BALLOONS: On the left is a "Strato Sentinel," a 68,000 cubic ft. capacity, six-lobed envelope. Above it is 30,000 cubic ft.

D.5.

London Gazette:

Royal Air Force

Air Ministry, July 4, 1941.

General Duties Branch.

The folg. are granted commns. for durn. as P/Os. on probn.:—W/O.: (June 8) S. T. Carpenter. Flt. Sgts.: (Jan 31) J. F. Dobbs, O. E. Simpson; (May 27) J. C. Wells; (June 5) P. A. R. Keates, B. N. Phillips. Sgts.: (Jan. 31) R. H. Aldis, P. W. G. Burgess, C. F. Whiting; (Mar. 29) J. G. Jones; (May 22) G. F. Betts, D.F.M.; (May 27) W. S. Chubb, W. I. Lashbrook, D.F.M.; (May 29) P. C. Bargh, A. J. Calvert; E. J. Keenan, H. W. Stone, F. W. Hoddinott, L. A. Rickinson.

P/O. on probn. J. Flinders is confmd. in his appt. and promoted to war substve. rank of F/O. (Apr. 1.)

Wing Cdr. H. N. Thornton, M.B.E., is promoted to rank of Grp. Capt. (temp.). (June 1.)

Flt. Lt. V E. Marshall is promoted to rank of Sqn. Ldr. (temp.). (June 1.)

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(May 25) H. H. Taylor; (May 25) S. P. Stephenson, I. B. Westmacott; (May 28) L. Miller, K. W. Tait, D.F.C.; (June 27) N. H. Svendsen, D.F.C.

The folg. P/Os. are promoted to war substve. rank of F/O.:—(Apr. 10) L. F. D. King; (Apr. 11) W. G. Bennetts 2nd Lt., R.A., T.A.; (Apr. 28) R. F. Philo; (May 18) F. W. Hillman; (May 25) P. Bray; (June 1) W. R. N. Sturdy.

P/O. on probn. F. W. Cook is promoted to war substve. rank of F/O. on probn. (May 15.)

The folg. P/Os. are granted war substve. rank of F/O.:—(May 5) A. P. Culverwell.

Air Vice-Marshal J. T. Babington, C.B., C.B.E., D.S.O., is granted act. rank of Air Marshal. (July 7.)

Air Vice-Marshal R. H. Peck, C.B., O.B.E., is granted act. rank of Air Marshal. (July 1.)

SERVICE AVIATION

Air Comdre. H. E. P. Wigglesworth, D.F.C., is granted act. rank of Air Vice-Marshal. (June 1.)

Grp. Capt. (act. Air Comdre.) A. C. Collier, C.B.E., is granted act. rank of Air Vice-Marshal. (June 25.)

Sqn. Ldr. J. E. Kirk is transld. to Technical Branch. (Apr. 24, 1940.)

Flt. Lt. H. M. Hammond takes rank and precedence as if his appt. as Flt. Lt. bore date Jan. 28. Reduction to take effect from May 8.

F/O. R. J. Peacock takes rank and precedence as if his appt. as F/O. bore date Sept. 23, 1940. Reduction to take effect from May 8.

Flt. Lt. J. B. Usher resigns his commn. (June 23.)

Technical Branch.

The folg. are granted commns. for durn. as F/O. on probn.:—W/O.: (June 10) J. Brady. As P/Os. on probn.:—W/Os.: (Apr. 22) E. W. C. Oldfield; (May 7) P. Robinson; (June 11) G. V. Meredith. J. R. Brittan. Flt. Sgts.: (Apr. 14, Sen. Nov. 26, 1940) P. W. Nunn; (May 21) J. E. W. Howell; (June 10) A. C. Sleigh, R. I. Gray. Sgts.: (Apr. 15) R. H. Fluke; (May 29) W. R. Bendall. As Act. P/Os. on probn.:—Act. W/O.: (June 6) H. L. Pugh. Flt. Sgts.: (May 29) E. C. Bicheno; (June 6) W. G. Chapman; (June 15, Sen. Nov. 26, 1940) S. F. W. Martin, I. Roberts, W. M. Bush, N. R. C. Lee, A. J. Hurlston. Sgts.: (June 6) B. G. Chapman, A. M. Paterson; (June 13), Sen. Oct. 16, 1940) A. D. Balmain.

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(June 30) C. M. Williams, L. Avery, R. H. Howse.

F/O. C. Howells is granted war substve. rank of Flt. Lt. (Mar. 9.)

The folg. F/Os. are granted war substve. rank of Flt. Lt.:—(May 10) H. P. Johnston; (May 12) W. J. Elvin.

P/O. on probn. R. T. Beves is promoted to war substve. rank of F/O. on probn. (June 1.)

P/O. H. A. P. Watkins is granted war substve. rank of F/O. (May 14.)

F/O. on probn. J. R. Savory relinquishes his commn on account of ill-health. (June 24.)

Administrative and Special Duties Branch.

The folg. are granted commns. for durn. as F/Os. on probn.:—W/Os.: (May 31) E. Hulks, H. J. Coppin, A.F.M.; (June 6) W. H. Saxby; (June 9) C. Adams, R. Tandy, M.M.; (June 12) A. H. New. As P/Os. on probn.:—W/Os.: (May 31) F. Banks, A. E. Clift; (June 2) F. G. Christopher, H. Humphries; (June 13) W. C. Penney. Flt. Sgt.: (June 3) A. Lewis. As Act. P/Os. on probn:—Flt. Sgt.: (June 6) E. N. Clements; (June 13) G. S. Westwood. Sgts.: (June 6) W. C. Preston; (June 13) H. J. Compton, V. J. Chapman.

The folg. F/Os. are granted war substve. rank of Flt. Lt.:—(Apr. 18) T. Hatcher; (May 1) S. A. Jorden; (May 12) F. W. Harris; (May 17) B. J. Skinner; (May 22) A. Smith.

P/O. on probn. R. S. F. Williams is promoted to war substve. rank of F/O. on probn. (May 15) and confmd. in his appt. (June 27).

P/O on probn. C. H. Leese is promoted to war substve. rank of F/O. on probn. (May 15.)

The folg. P/Os. are granted war substve. rank of F/O:—(May 12) C. J. Williams; (May 14) R. James.

Equipment Branch.

The folg. are granted commns. for durn. (June 6) as F/O. on probn.:—W/O.: D. Masters. As P/O. on probn.:—W/O.: H. Adams.

F/O. A. W. B. Scott is promoted to rank of Flt. Lt. (temp.). (June 1.)

The folg. P/Os. on probn. are promoted to war substve. rank of F/O. on probn.:—(Mar. 1) R. E. J. Blanche; (Apr. 1) J. W. Henley; (May 15) R. C. Hayton.

P/O. L. H. Palmer is granted war substve. rank of F/O. (May 24.)

Accountant Branch.

P/O. on probn. E. V. Hambry is confmd. in his appt. and promoted to war substve. rank of F/O. (June 16.)

F/O. H. Murray is promoted to war substve. rank of Flt. Lt. (June 2.)

F/O J. W. Hartzig is granted war substve. rank of Flt. Lt. (May 17).

The folg P/Os. are granted war substve. rank of F/O.:—(May 1) A. G. Millard; (May 8) F. R. Helliwell.

Medical Branch.

The folg. officers are granted commns. for durn. in the relative ranks stated (present seniority being unaffected):—Relative rank of Flt. Lt.: (Apr. 25) Miss A. D. M. Adams, B.M., B.Ch., M.R.C.S., L.R.C.P.; Miss W. H. Redmond, M.R.C.S., L.R.C.P. Relative rank of F/O.: (Apr. 25) Miss E. D. Fenwick, M.R.C.S., L.R.C.P.; Miss A. M. Clark, M.B., B.Ch., M.R.C.S., L.R.C.P.; Miss M. M. Dobson, M.D., B.S., M.R.C.S. L.R.C.P.; Mrs. E. V. Butler Jones, M.R.C.S., L.R.C.P.; Miss K. Byrt, M.B., Ch.B.; Miss A. C. Gillan, M.B., Ch.B.; Miss B. A. Briant, M.B., B.S., M.R.C.S., L.R.C.P.; Mrs. A. L. J. Dovey, M.B., Ch.B.; Miss M. I. Macnaughton-Jones, M.D., B.S., M.R.C.S., L.R.C.P.; Miss J. H. Norton, M.D., Ch.B., D.P.H.; Miss A. C. Clark, M.B., B.Chir., M.R.C.S., L.R.C.P.; Miss G. E. M. Meyer, M.R.C.S., L.R.C.P.; Miss M. J. Allardice, M.B., B.S., M.R.C.S., L.R.C.P.; Mrs. W. A. Kane, M.R.C.S., L.R.C.P., D.P.H.; (May 2) Miss M. Calvert, M.B., B.Ch.; Miss K. E. A. Smith M.B., B.Ch.; (May 13) Miss P. G. Cooper, M.R.C.S., L.R.C.P.; Miss S. M. C. Murray, M.B., B.S.

The folg. Flt. Lts. are granted war substve. rank of Sqn. Ldr.:—(May 7) J. S. Carslaw, M.B., Ch.B.; (May 10) T. D. L. Bolan, L.R.C.P. and S.

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

Flt. Lt. A. C. Cuming (Supty. List) is promoted to rank of Sqn. Ldr. (temp.). (Apr. 15, 1940.)

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Apr. 29) R. D. Crofton; (June 13) C. Kirkland; (June 29) N. S. T. Benson, R. A. D. Foster, W. McF. Russell, D.F.C.

Sqn. Ldr. H. R. Hughes-Hallett relinquishes his commn. on account of ill-health. (June 20.)

P/O. P. L. Gibson resigns his commn. (June 22.)

Administrative and Special Duties Branch.

Flt. Lt. F. B. L. Moore relinquishes his commn. on account of ill-health. (July 1.)

F/O. L. B. McGoverne resigns his commn. (June 4.)

Royal Air Force Volunteer Reserve

General Duties Branch.

The folg. are granted commns. for durn. as F/Os.:—(May 16) K. G. Crockett, E. L. Sprosson. As P/Os. on probn.:—Sgts.: (Jan. 31) P. Dixon; (Mar. 29) F. C. Ballantine; (Mar. 16) G. M. Dickson, P. J. J. Roberts; (Apr. 1) R. G. White; (Apr. 10) C. L. Harris; (Apr. 23) J. D. Bridge, R. A. D. Brown, A. W. Friend, D. K. Hodge, E. U. Johansen, G. Krogsbol, D. G. Mackay, J. Musgrave, T. W. Posselt, J. D. B. Rigby, H. C. Cumming, D. F. Gosling, A. W. Park, A. W. Searle, I. H. R. Shand, G. G. K. Taylor, I. R. Thomson; (May 8) J. Tweedale; (May 14) P. Singleton; (May 15) P. F. Hickling; (May 16) S. W. M. Powell; (May 17) C. D. V. Sorby; (May 22) C. B. J. Porter; (May 27) P. Johnston; (May 29) J. P. N. Britton, G. Ford, C. Longden, B. J. Redmond; (June 5) C. G. Hughes, D.F.M., L. W. Metcalfe, A. H. C. Lynes, A. A. Horne, W. S. Marshall, A. H. Piper; (June 10) J. A. Anstie, D. F. Birch. L.A/Cs.: (Mar 16) P. McL. Allardice, A. S. Raphael; (Apr. 20) J. D. Margrie, S. W. Turner; (May 8) B. W. J. Peatheyjohns, P. W. Speller; (May 17) R. H. W. Clarkson, A. A. Fox, G. Hunter; (May 18) R. G. Baker; (May 29) W. Anderton, R. Aytoun, R. A. Bance. C. H. Beet, D. R. Bowden, K. Brown, A. T. Buckland, A. Carter, J. T. Chrystal, R. G. Churcher, D. A. Cook, I. R. Fyfe, B. D. C. Gibson, T. W. G. Godfrey, N. Holden, D. C. Hunter, R. H. Imeson, R. C. Macandrew, F. J. A. Morgan, J. L. Okell, D. G. H. Pike, P. R. M. Runnacles, H. L. Shackleton, A. R. Skone, E. O'C. Tandy, H. S. L. Underwood; (June 8) T. G. H. Gulliver, A. O. Langley, W. R. M. McClelland, R. E. Millbank, J. E. R. Rawstorne, N. B. Rutherford, T. J. Scoffield, J. R. Tye.

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(Mar. 24) P. R. D. A. C. Macdonald; (Apr. 30) I. H. Edwards; (May 12) N. Parry; (May 13, Sen. Oct. 3, 1940), C. R. Miles; (May 19) B. Davey; (June 10) W. A. A. Read; (June 18) P. J. T. Stephenson, J. E. Sulman, A. W. Bevan, P. C. Cox, H. G. Hubbard; (June 20) K. W. Hinds; (June 24) J. R. Juleff, R. L. Lamb, W. D. Wiseman; (June 26) D. C. Sandeman; (June 30) D. Balmforth; (July 3) W. M. E. Crump.

The folg. P/Os. on probn. are confmd. in their appts (Mar. 15) and promoted to war substve. rank of F/O.:—(May 4) A. G. Little, H. S. Uberoi.

The folg. P/Os. on probn. are confmd. in their appts. (Mar. 26) and promoted to war substve. rank of F/O.:—(May 4) F. A. Meek, R. Oakes.

The folg. P/Os. on probn. are confmd. in their appts. (Apr. 20) and promoted to war substve rank of F/O.:—(May 13) J. M. Ritchie, F. F. P. Webber.

P/O. on probn. M. Pinker is confmd. in his appt. (Apr. 20) and promoted to war substve. rank of F/O. (May 15.)

P/O. on probn. H. T. Blench is confmd. in his appt. (Mar. 29) and promoted to war substve rank of F/O. (May 16.)

P/O. on probn. E. T. Wilcox is confmd. in his appt. (Apr. 12) and promoted to war substve. rank of F/O. (June 1.)

P/O. on probn. E. L. B. Kent is confmd. in his appt. (May 4) and promoted to war substve. rank of F/O. (June 1.)

Act. P/O. on probn. R. Van Den Bok is graded as P/O. on probn. (Aug. 26, 1940.)

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(May 10) D. S. Wallen; (June 29) L. H. Grant.

The folg. P/Os. are granted war substve. rank of F/O.:—(May 9) G. W. Hodgson; (May 16) W. E. Perrin; (May 17) C. D. Barnard; (May 21) J. H. Clark; (May 22) J. Hurry; (May 24) G. E. Goode, D.F.C.

F/O J. S. Trotter relinquishes his commn. on account of ill-health. (June 24.)

The commn. of P/O. J. R. D. Strange is terminated on cessation of duty. (June 25.)

The notifn. of June 20 concerning the folg. Act. P/Os. is cancelled:—C. Campbell, E. A. Stoney.

The notifn. of May 23 concerning P/O. F. R. Goddard is cancelled.

Technical Branch.

The folg. are granted commns. for durn. as P/O. on probn.:—(Apr. 28, Sen. Nov. 29, 1940) F. H. Wilks. As Act. P/Os. on probn.:—(May 16) N. L. Parlett; (May 30) J. S. Cresswell; (June 6) G. R. Betton-Foster, J. A. Garrod, L. T. B. Kealey, H. W. Oliver, G. A. Rivers, K. W. Turner, G. St. G. Wheeley. Flt. Sgt.: (June 13) J. G. Gunn. L.A/Cs.: S. G. Bullen; (June 6) N. D. Benson. A/C.2: S. Laurie-Walker.

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(Apr. 28) C. Troup; (May 4) H. Allen, G. B. P. Trippe; (May 18) A. R. Hart, E. R. L. Lewis; (May 24) T. M. Wood; (May 31) W. P. Gregg; (June 21) F. R. McQuown.

The folg. F/Os. are granted war substve. rank of Flt. Lt.:—(Feb. 6) D. H. Johnson; (May 16) H. Dinwoodie, M.C.; (May 17) A. M. Hardie, S. F. Evans, C. Tinker.

The folg. P/Os. are granted war substve. rank of F/O.:—(Nov. 5, 1940) A. H. E. Rogers; (May 1) F. Jullion, H. M. Stevenson; (May 8) J. W. Stansfield; (May 23) K. W. Edwards.

The notifn. of May 2 concerning P/O. H. Allen is cancelled.

Balloon Branch.

The folg. are granted commns. for durn. as P/Os. on probn.:—Flt. Sgt.: (June 14) J. M. Twigg. Sgt.: R. T. Lawrence. L.A/C.: (June 4) H. C. Greenwood; (June 12) N. C. Heather; (June 14) B. M. Charig.

P/O. on probn. T. R. H. Kane is confmd. in his appt. and promoted to war substve. rank of F/O. (May 12).

P/O. R. S. Ridgway is granted war substve. rank of F/O. (May 26).

F/O. E. A. Gorton is transld. to Administrative and Special Duties Branch (June 18).

Administrative and Special Duties Branch.

Sqn. Ldr F. Workman, M.C. (R.A.F., Ret.) is granted a commn. as Flt. Lt. (Feb. 20).

The folg. are granted commns. for durn. as P/Os. on probn.:—(May 15) W. B. Wake; (May 16) E. F. Daglish; (May 23) J. H. P. Brooker, P. L.

A LONG INNINGS: Each raid over Germany or Occupied France is duly noted on a Whitley score card. A second line will soon be necessary.

SERVICE AVIATION

Bullen; (May 29) T. T. Paterson; (May 30) R. W. Gardner, F. A. Handsley, T. C. G. Rosby; (May 31) D. C. Smith; (June 3) R. Carfrae; (June 5) R. J. Getty; (June 6) H. M. M. Acton, E. Ballard, E. H. Barnett, D. J. Benson, F. L. Birch, C. MacC. Buckley, F. M. Caine, J. Chadwick, E. A. Chapman, C. W. Edwards, E. C. Geary, J. W. Gibbs, E. R. Gordon, J. H. Gould, H. Hall, S. M. Harris, H. Hawke, R. C. Hayman, D. A. Haywood, F. S. Jennings, C. O. Larkin, G. K. Lawrence, R. F. Little, E. A. Maillard, K. B. Martin, C. A. Payne, G. W. B. Plant, G. Reid, W. F. B. Smee, C. A. Smith, E. C. Smith, B. G. T. Thomson, E. A. P. L. Townshend, D. R. L. Verne; (June 7) R. G. Davies; (June 16) H. B. Holbrook, F. W. Merrin, A. Plowman, K. A. Povah. Flt. Sgt.: (June 3) S. J. Dowd. Sgt.: (Dec. 11, 1940) R. P. McDouall; (June 6) L. G. Blomfield. L.A/C.: (May 15) H. C. Jolly. A/C.1: (May 2) C. G. Hutchinson; (June 2) J. D. Dill-Russell. A/C.2: (June 7) R. H. Bulmer. As Act. P/Os. on probn.:—(June 3) G. A. Douglas; (June 6) The Marquess of Carisbrooke, G.C.B., G.C.V.O., N. G. Quenet; (June 11) G. E. Forrest; (June 13) E. P. Bacon, J. G. Batchelor, J. E. Briggs, T. C. Clough, T. T. Curr, A. C. Davies, R. Dunn, H. A. Mason. Flt. Sgts.: (June 6) L. G. Glanfield; (June 13) W. F. J. Kelly, K. N. Sydenham. Sgts.: (Mar. 10) J. Dade; (June 6) K. W. Boyer. Cpls.: (June 13) G. R. Boak, J. G. Maddison, C. A. R. Stone. L.A/C.: (June 6) S. Littman, I. McLean; (June 13) A. P. D. Osland, W. E. Adams, C. J. Brown, N. P. M. Elles, C. L. Knowles. A/C.1: (June 6) W. A. Carrot, N. R. North, J. S. White, G. L. Martin, E. Brookes; (June 13) S. C. H. Bowie, D. Livingston, G. E. Payne, L. A. Wallis. A/C.2: (June 6) R. S. Seth, J. Q. Montgomery, E. R. Jackson, G. Beer, N. G. Foulkes, H. S. Latham, R. G. Vevers, J. A. K. Goldthorpe; (June 13) A. E. Briggs, G. A. Chalk, M. H. D. Snape, W. J. G. Verco, A. F. Young, H. B. F. Jones, H. J. D. M. Jowitt, E. L. Hyner, D. M. Lindner, W. H. Marwood, B. A. G. Rolls, W. Blackwood, R. G. Teakle, C. M. C. Albrecht, G. D. Hignett.

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(Mar. 4) A. R. Saward; (May 1) G. R. Belt, The Earl of Morton, E. C. Eggleton; (May 4) H. D. Fowler, G. R. Stanbridge; (May 9) R. B. Black; (May 14) J. M. McBain, J. C. Nixon, H. Rhodes, (May 17) J. N. Roberts; (May 20) C. F. de Hamel, J. E. de Kantzow; (May 25) P. L. Hogan; (May 27) R. A. Frost; (May 30) M. M. de V. H. Neill; (May 31) W. H. Trickett; (June 4) A. P. Burnet, A. W. Byrne; (June 7) E. L. Dibben; (June 8) E. J. Smyth; (June 10) H. O. Johnson; (June 11) A. W. Hickling, H. C. R. Holden, F. C. Sampson; (June 12) L. A. Hooper; (June 13) E. A. Evenden; (June 14) F. W. Cram; (June 17) L. M. Heritage; (June 18) H. S. Harwood; (June 19) G. E. Smith; (June 22) A. C. Dollamore; (June 25) H. E. Horsfield; (June 27) A. P. F. Schneidau; (June 28) A. T. Stock.

The folg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Mar. 16) W. A. F. Alderton; (Apr. 4) P. G. Dwyer; (Apr. 11) A. P. McIntosh, D. Aber, G. H. Dingle, E. P. Appleton, F. N. Penn, K. W. Ashberry, T. L. Dodd, A. L. Spiller, R. D. Usherwood, A. H. Lowe; (Apr. 18) F. A. W. Brockes, (Apr. 25) C. G. Heron, F. W. Goulding, J. T. C. Long; (Apr. 29) R. D. E. Lewis; (May 1) L. Hartley; (May 5) G. K. Meakin; (May 17) D. N. Harris; (June 2) R. D. McLaren.

The folg. P/Os. are granted the war substve. rank of F/O.:—(Feb. 22) B. H. Bevan-Petman; (Mar. 12) W. S. J. Scruby, O.B.E.; (May 1) A. G. T. Hardy, A. D. Waldron, A. Smith, G. B. Rosen, A. J. Ball, A. A. V. Waterfield, C. H. Harris, H. Sharples, M.C., J. Smith, E. G. Waldy, E. S. Harman, F. H. Hayley-Bell, D.S.O., A. Cairns, H. Massingham, C. A. Redgrove, D. H. Tingey, H. Heywood-Jones, C. P. Cowper, J. W. Girling, C. A. Langton, J. L. McI. Oliphant, F. B. S. Grimston, G. Adams, A. W. Colley; (May 3) R. E. Pearmund, H. H. Smetham, M.C.; (May 4) P. J. A. Scott; (May 6) E. W. Hutchings, A. A. John; (May 8) W. J. H. Jones, R. M. Walker; (May 9) J. L. Hayward, E. Nordberg, D. S. Cross; (May 11) J. H. D. Young; (May 11) D. R. Barker, A. F. Clutton-Brock, M. C. D. Wilson, W. M. Blackwood; (May 12) R. I. Hastings, K. S. Wood, W. S. Walker; (May 14) N. B. Davis, J. D. C. Curtis, M.B.E., M.C.; (May 17) J. Webster, M.C.; (May 18) R. Duce, J. C. F. Wingate; (May 19) H. W. Wood, E. B. Birtwhistle; (May 20) C. E. Browning, D.S.O., B. Weil; (May 21) G. Jacob; (May 23) E. R. H. Hill, R. E. K. Pembrook; (May 24) E. A. Tilling, E. T. Dangerfield, A. R. Reeve; (May 25) C. H. Schofield; (May 26) D. F. Hellings, E. O. D. Keown; (May 28) G. H. B. Diprose; (May 29) A. A. Baden Fuller.

P/O. G. C. R. Franks is transfd. to General Duties Branch (Mar. 18).

The folg. are transfd. to Technical Branch:—Flt. Lt.: (Mar. 23) J. S. Bamford. P/Os. on probn.: (Apr. 24, 1940) E. I. M. Bird (since promoted); (Aug. 14, 1940) W. A. Mair (since promoted); (Oct. 5, 1940) E. A. McClintock; (Feb. 11) J. F. Mazdon; (Apr. 23) J. H. Smith; (May 7) W. G. G. Petre; (May 26) G. T. Armstone, A. Dalziel; (June 9) G. G. Wingfield.

The folg. F/Os. relinquish their commns. on account of ill-health:—(July 1) J. E. I. Skelton; (July 2) G. S. Rogers.

The folg. F/Os. resign their commns.:—(June 18) H. Boydell; (June 21) C. C. K. Dagg.

Flt. Lt. H. R. Lowry is cashiered by sentence of G.C.M. (June 19).

P/O. E. B. Lewis is dismissed the Service by sentence of G.C.M. (June 17).

Meteorological Branch.

T. W. Vernon-Jones is granted an hon. commn. as Wing Cdr. (June 17).

Act. P/O. on probn. W. Wiseman is graded as P/O. on probn. (Dec. 9, 1940, substd. for notifn. of Apr. 18).

Training Branch.

The folg. are granted commns. for durn. as Act. P/Os. on probn.:—(Feb. 1) J. R. Abbott, F. C. Ashley, H. Bleasdale, A. J Blue, S. F. Croxford, L. Evans, H. A. Harris, J. L. A. Hogg, W. H. C. Jennings, C. M. Locks, E. E. Lockwood, C. W. Matheson, J. Sharp, F. W. Weatherill, L. H. Webber, L. A. Willard, A. G. Woods, J. V. Yates; (Feb. 3) A. E. Young; (Feb. 6) W. Tennant; (Feb. 7) A. Constant; (Feb. 10) G. O. Thomas; (Feb. 12) G. J. Mortimer; (Feb. 14) A. T. Miller, J. H. Wensley; (Feb. 15) J. D. J. Blackett, A. McG. Dick; (Feb. 19) E. P. Greenspan, C. F. Williams; (Feb. 20) J. A. Corbett, G. Hawke; (Feb. 21) H. W. Chegwidden; (Feb. 22) W. E. Jones; (Feb. 26) H. Gough, R. B. Pitt, C.B.E., M.C., T.D.; (Feb. 28) R. W. Tricker; (Mar. 1) G. M. Chalmers, O. F. W. Pleasants, W. M. Stace, B. B. Woollard; (Mar. 3) G. W. P. Riley, M.B.E.; (Mar. 4) J. S. Rae, N. Sutcliffe, G. H. Weston; (Mar. 5) J. C. Cooke, H. H. Jones; (Mar. 6) F. F. McNeil, G. Paul; (Mar. 7) E. R. Harrop, T. Jones; (Mar. 8) J. Privett, A. Samuels, A. E. Slack; (Mar. 10) A. Rowbottom; (Mar. 11) H. G. Marriott, A. C. O'Neill, E. A. Tiley, A. J. Whitmarsh, D.S.O., M.C., T.D. (Mar. 12) H. Ballantyne, N. G. Lancaster, S. R. Leitch, R. A. Martin, W. H. Rose; (Mar. 13) E. R. Peal, C.B.E., D.S.C., W. Rigby; (Mar. 14) P. Markham; (Mar. 15) F. Barnes, B. Cromack, W. P. James, G. A. H. Macpherson, A. S. G. Rodway, E. F. Smith, A. E. Steer, D.F.M.; (Mar. 16) L. Edwards, A.F.C.; (Mar. 17) M. Hughes-Thomas, D. W. King, G. T. Mann, M. E. Nixon, H. A. Talbot; (Mar. 18) T. Beach, E. S. Chantrell, R. H. Miley, W. S. Newall, J. M. Quail, D.S.M., A.F.M., W. Rosenberg, A. Russell, W. Swift, M. C. Wilson; (Mar. 19) A. H. P. Bailey, S. Berry, F. H. Brewitt; (Mar. 20) A. Darbey, W. Reid, H. R. Vennard, J. B. Vickers; (Mar. 21) R. N. Bate, C. A. M. Bowman, T. E. T. K. Green, H. G. Holden, L. Rogerson, W. A. Swingler, W. J. Weir; (Mar. 22) N. E. S. Cameron, T. MacLaren; (Mar. 24) H. S. Bell, C. R. Browne, H. Craddock, H. J. L. Gorse, A. E. Hill, P. Kenworthy, A. S. Lomax, V. Stephens, E. Vickers, F. N. Weeks, E. Wilson, W. K. Worthington; (Mar. 25) H. La C. Bartrop, E. A. Bolton, J. S. A. Don, E. N. Griffith, C. B. Holland, F. Hosking, A. Jewells, A. E. Luxton, D. H. Manfield, G. Welton; (Mar. 26) A. B. Hyslop, C. J. Murfit, F. Wood; (Mar. 27) E. N. H. Chipperfield, C. Everitt, J. W. D. L. Godfray, S. A. Hinde, J. Jones, H. R. Spence, J. C. E. Wren; (Mar. 28) L. Bacon, F. S. Bromley, H. R. Clarkson, F. S. Emsley, K. D. Foster, A. S. Hanna, C. E. Neath, W. H. Oatley, T. J. Pugh, H. G. Rew, S. L. Ward; (Mar. 29) A. Arnott, W. Atkinson, F. J. Jordan, L. Malone, W. R. Newton, A. Traice; (Mar. 30) L. H. Mills; (Mar. 31) J. R. Davies, J. M. Hayes, W. Hobson, L. C. Johnson, W. H. Lucy, P. J. McShane; (Apr. 1) H. Graham, C. R. Jackson, C. Jameson, T. P. Tomlinson, C. M. Watterson; (Apr. 2) A. V. Barrett, W. C. M. Harbottle, R. J. Holden, R. F. Norris, J. Reay, P. E. Vranch; (Apr. 3) P. Bickerton, F. J. Boardman, J. A. Higham, W. B. James, C. R. Meade, G. M. Quayle, W. D. Vernon; (Apr. 4) R. L. Carter, A. C. Goldsmith, R. W. Parry, H. P. Sherwood, C. E. Worthington; (Apr. 5) C. L. Grimwood, R. C. Hardy; (Apr 6) J. W. Balmer; (Apr. 7) S. Gilliatt, T. D. Howells, H. V. Laurie, D. Lewis, B. W. Mainwaring, F. C. C. Rayson, A. N. Skelton, A. Trevillion, G. A. Wardale; (Apr. 8) F. W. Bethell, A. Hancock, H. G. R. Stevenson; (Apr. 9) B. F. Fox, E. J. Greaves, P. A. Groombridge, J. C. Harrison, G. E. Hovell, G. Jeffrey, J. McG. Knox, W. F. Mayoss, F. A. Murray, H. J. Skrine, E. J. H. Wright; (Apr. 10) R. V. Best, A. E. Bradshaw, L. S. Knight, L. Legg, C. E. Metcalf, G. W. Smees, A. R. Thomas, F. M. Wilkinson; (Apr. 11) C. R. Dollery, E. Howells, E. Hugh; (Apr. 12) D. J. Parsons, L. L. Williams; (Apr. 14) R. W. Bond; (Apr. 15) E. J. Day, F. Mosby; (Apr. 16) J. A. Jemmett, J. Nettleship, R. A. G. Travers; (Apr. 17) F. Cook, F. H Johnson; (Apr. 18) J. C. Evans, G. F. Greenwood, J. A. Holden, J. D. Lickley, A. A. D Toplis; (Apr. 19) T. C. Cake, K. D. Cowie, H. Crawford, A. W. Keith, W. R. Leadbetter, E. Lyon, C. T. Steward, S. I. Williams; (Apr. 20) J. P. Robb; (Apr. 21) H. Coggins, L. J. Harrhy, G. L. Kirk, H. Laycock, L. R. Sharp, H. R Smith; (Apr. 22) R. L. Bidgood, A. Denny, W. E. Lees, H. J. Prickett, D. H. Wheeler; (Apr. 23) P. J. B. Griffiths, E. Hugh, O. T. Lewis, J. R. Richards, W. L. Seaby, I. P. Tidman; (Apr. 24) J. A. Ayers, J. N. Davies-Jenkins, T. F. Davies, A. Fox, J. W. Lambert, F. Myatt, W. Shackleford, H. H. Thomas; (Apr. 25) D. G. Price; (Apr. 26) W. J. Tarring; (Apr. 28) G. W. Bagshaw, C. Howell, G. W. Jones, O. S. Marrows, H. L. W. Sharman, R. Sharpe, J. A. Smith, H. Turner; (Apr. 29) E. A. Evetts, J. D. Livingstone, T. M. Rees, E. L. Wilson; (Apr. 30) A. G. Raven, W. Thacker; (May 1) J. Butterfield, E. J. Evans, A. E. Moore, H. Ralph, C. L. Watson; (May 2) W. Caldwell, T. Chorley, E. B. P. Gillett, F. Hill, W. N. Morgan-Brown, J. F. Sitch, T. H. Wroughton; (May 3) W. H. Evans, W. R. Thomas, K. Willmore; (May 4) F. M. Edwards, R. P. Graham, A. H. G Kerry; (May 5) E. S. Stock, W. H. J. Woodward; (May 6) E. F. Bowman, L. Lewis, R. Platt; (May 7) R. S. Cappell, J. A. V. Judson; (May 8) K. Gooding; (May 10) A. R. Simpson; (May 12) C. N. Ramsay, J. C. Sleigh; (May 15) H. W. Geddic, R. K. Haestier; (May 19) A. W. Dobson, M.C.; (May 22) J. Seddon, M.C.; (May 28) W. Spiers; (June 5) H. A. Peter; (June 9) H. G. Higgins; (June 11) T. B. Inman, J. P. Woolfe; (June 14) B. W. Hammond.

Act. P/O. W. G. Norden resigns his commn. (June 24).

Equipment Branch.

The folg. are granted commns. for durn as Act. P/Os. on probn. (June 6):—A/C.1 C. H. M. Williams, A/C.2 M. C. Riches.

The folg. P/Os. on probn. are confmd. in their appts. (Apr. 2) and promoted to war substve. rank of F/O:—(May 13) T. N. Alderdice, A. McN. Chassels, I. Macfarlane; (May 14) G. C. Murray.

The folg. Act. P/Os. on probn. are graded as P/Os. on probn. (May 16):—D. Grant, H. M. Hughes, A. F. Jones, R. J. Kinsey, P. G. Kirkaldy, A. L. Kershaw.

The folg. P/Os. are granted war substve. rank of F/O.:—(May 1) C. P. Renshaw, K. S. Winbush; (May 10) W. S. Baddeley, H. B. Johnson, S. W. G. Morton; (May 18) L. J. Halley, R. A. Hyde; (May 27) A. Barron, G. A. Bunkels.

P/O. on probn. J. Sheach relinquishes his commn. on account of ill-health (July 3).

Accountant Branch.

P/O. on probn. J. E. Simpson is confmd. in his appt. (May 18) and promoted to war substve. rank of F/O (June 29).

Act. P/O. on probn. M. E. Graham is graded as P/O. on probn. (Nov. 20, 1940).

The folg. P/Os. are granted war substve. rank of F/O.:—(May 1) C. O. Bartley, A. L. Thomson; (May 18) E. A. James; (May 21) H. B. Ravilious.

Medical Branch.

The folg. are granted commns. for durn. (June 3) as Wing Cdr.:—H. O. Clarke, M.B., B.Ch., F.R.C.S., F.R.C.S. (I.). As Sqn. Ldr.:— N. S. Alcock, M.B., Ch.B., M.R.C.P. (Lond.). As Flt. Lts.:—E. Granger, M.B., Ch.B.; N. Rawstron, M.B., Ch.B., D.P.M. As F/Os.:— J. R. Acfield, M.B., Ch. B.; J. J. Black, M.B., B.Ch.; J. Boardman, M.B., Ch. B.; J. V. Braithwaite, M.R.C.S., L.R.C.P.; T. W. Brindle, M.B., Ch.B.; T. J. Cockburn, M.B., Ch.B.; W. B. S. Crawford, M.B., B.Ch.; J. B. Fawcitt, M.R.C.S., L.R.C.P.; J. W. Fleming, M.B., Ch.B.; J. S. Fraser, M.B., Ch.B.; W. G. F. Gibson, M.B., B.Ch.; L. R. Mattison, M.R.C.S., L.R.C.P., D.P.H.; C. Midwinter Jones, M.R.C.S., L.R.C.P.; M. S. Rowley, M.B., Ch.B., M.R.C.S., L.R.C.P.; J. H. Smart, M.B., B.S., M.R.C.S., L.R.C.P.; A. C. Smerdon, M.B., Ch.B.; T. F. Stewart, M.B., Ch.B., F.R.F.P.S.; J. E. G. Vincenzi, M.R.C.S., L.R.C.P.

Flt. Lt. C. Barton, M.B., B.Ch., is granted war substve. rank of Sqn. Ldr. (May 1).

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.—(Aor. 16) K. G. Irving, M.R.C.S., L.R.C.P.; R. Rassin, M.B., Ch.B., F.R.C.S.; (June 4) E. R. Hodson Todd, M.R.C.S., L.R.C.P.; (June 18) G. L. Pett, M.B., B.S., M.R.C.S., L.R.C.P.; G. A. Strain, M.B., Ch.B.; (June 19) P. S. A. Heyworth, M.R.C.S., L.R.C.P.

Dental Branch.

The folg. are granted commns. as F/Os. for durn.:—(May 23) E. C. Minns, L.D.S.; (June 3) K. M. Atkinson, L.D.S.; D. W. Bugg, L.D.S.; F. B. Bys-Perry, L.D.S., C.D.F.M.P.; J. R. Dyet, L.D.S.; P. A. Edge, L.D.S.; L. Everest, L.D.S.; P. V. Farrell, L.D.S.; G. Heaton, B.D.S.; S. Hurst, L.D.S.; I. H. Ingram, L.D.S.; N. M. Lawrence, L.D.S.; R. L. C. Mallen, L.D.S.; D. W. Manning, L.D.S.; H. S. McCall, L.D.S.; M. R. Ross, L.D.S.; J. N. Sawley, L.D.S.; E. B. Wight, L.D.S.

Chaplains Branch.

The folg. are granted commns. for durn. with relative rank of Sqn. Ldr.:—(Mar. 31) Rev. J. Busfield; (Apr. 16) Rev. E. C. B. Dunford, B.A.; (May 20) Rev. B. L. Spurgin, B.A.; Rev. D. K. Oldring, B.D.; (May 27) Rev. M. G. M. Pitt; (June 3) Rev. J. P. Doherty, Rev. J. W. Sharp, B.A., Rev. R. de B. Welchman, M.A., Rev. J. H. W. Fisher, Rev. B. H. Sackett, M.A. B.D., Rev. F. C. McNulty, Rev. V. Rochford, Rev. E. J. Thomas; (June 9) Rev. D. I. Edwards, B.A.; (June 10) Rev. J. H. Eckersley.

Rev. L. Chidley relinquishes his comma. on account of ill-health (June 30).

Auxiliary Air Force

General Duties Branch.

Act. P/O. on probn. M. C. X. Mack is confmd. in his appt. and graded as P/O. (Jan. 5).

Women's Auxiliary Air Force

The officers shown on pages 1164 to 1190 of the Air Force List for May, 1941, who are at present serving, except those mentioned below, are granted commns. for durn. in ranks indicated, with effect from Apr. 25, 1941 (their present seniority being unaffected). Officers will normally be on probn. until they have completed one year's service:—S/O.: E. B. A. Spafford. Assist. S/Os.: E. M. Clapman, D. S. Webber, K. B. Beauman, F. M. Denholm, J. K. Davy, M. Steuart-Jones, C. M. Aston, M. B. Russell, F. E. Sinclair, M. K. Dodsworth, P. C. Sant, P. Clive, E. C. Towse, G. O. Trapman, M. D. Gardner, D. Frost, R. Suffolk, C. Press, B. C. McInnes, L. F. E. Wall, J. Walton, J. E. H. Nicolls, J. M. Bickerstcth, C. E. Clough, A. D. Anderson, P. J. Martin, M. E. F. Wheatley, J. W. Nicholson, V. F. Lee, P. C. Cragg, E. D. Pige-Leschallas, M. Concannon.

Assist. S/O. P. M. Salmond relinquishes her appt. at own request (Apr. 26).